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The Geographical Journal

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THE MOUNT EVEREST EXPEDITION

Lieut.-Colonel C. K. Howard-Bury, D.S.O., Chief of the Expedition

Read at the Joint Meeting of the Society and the Alpine Club at the Queen's Hall, 20 December 1921. Maps following p. 152.

OF Mount Everest and the country that surrounded it very little was previously known, and the maps of that district were vague and inaccurate. Mount Everest was discovered and measured from the plains of India from a distance of about 150 miles about the year 1850, but it was not given the name of Mount Everest until 1858, in honour of Colonel Everest, who was the Surveyor-General in India at the time of its discovery. The top of it can be seen from Sandak-phu and Phallut, places near Darjeeling, at a distance of about 90 miles, where it appears between the peaks of Makalu. In 1905 the late General Rawling and Colonel Ryder, the present Surveyor-General of India, following the course of the Brahmaputra, climbed up to the southern watershed of the Brahmaputra and had a distant view of Mount Everest from the north from about 80 to 90 miles. From this view-point they were able to see a great distance along the chain of the Himalayas, and were able to say that there was no doubt that it was the highest mountain in that range. Captain Noel tried to approach Mount Everest in 1913 through Tashirak, but was unable to get any near view of the mountain, and was stopped by the Tibetan authorities from approaching any nearer.

Political obstacles have always stood in the way of any exploration. Mount Everest is situated on the borders of Tibet and Nepal, both of which countries are closed to Europeans. The Gurkhas have always objected to Europeans coming into their country, and public feeling there is still very strong on the subject. In Tibet, too, there has been a great prejudice against the foreigner, and we also had a self-denying ordinance with Russia by which neither country would allow their subjects to enter Tibet. Last year, however, owing to the changed political conditions it became possible to approach the Tibetan Government with a request that permission be granted for an expedition to proceed to Mount Everest. Mr. Bell was at the time going to Lhasa on a special mission from the Government of India, and, thanks to his personal friendship with the

Dalai Lama, he was able to obtain permission for the expedition to start, and the Dalai Lama, besides giving the expedition a passport, sent written instructions to all the governors of the districts through which we were to pass that they were to give us all facilities, and were to help us in every way, which orders were carried out to our entire satisfaction, in spite of the fact that this policy was the very opposite to their traditional policy of the total exclusion of foreigners from the country.

The object of this year's expedition was to make a thorough reconnaissance of Mount Everest and of the approaches to it from the north, east, and west, and to find out whether a possible route existed that would lead to the summit, and that was not physically impossible. For the purely mountaineering part of the work we had Mr. H. Raeburn, the leader of the mountaineering party, Dr. Kellas, Messrs. Mallory and Bullock, all members of the Alpine Club. In addition to this object there was the very important work of surveying and mapping the unknown territory through which we were travelling and the very difficult mountainous regions that surrounded Mount Everest. For this purpose the Government of India had kindly lent the expedition two officers of the Survey of India, Major H. T. Morshead, D.S.O., and Major Wheeler, M.C., R.E. Major Morshead had already had a considerable experience of travelling in Tibet, having completed valuable travels and survey work in the Kham and eastern districts. Under him were three native surveyors, one of whom was left in Sikkim to revise the existing and out-of-date maps of that country; the other two, Lalbir Singh and Gujar Singh, accompanied us. Major Wheeler, the other surveyor, was an expert in the Canadian system of photo-survey, a method especially useful in difficult and mountainous country. The Indian Government had also lent the expedition the services of Dr. A. M. Heron, of the Geological Survey of India, to study the geology of the region, about which nothing was known. Mr. A. F. R. Wollaston, also a member of the Alpine Club, and well known for his journeys in Africa and New Guinea, accompanied the expedition in the capacity of doctor, naturalist, and botanist, and had brought out with him a complete collector's outfit.

At the beginning of the year, as soon as permission for the expedition had been granted, preparations were immediately begun to collect stores and to arrange for the Alpine and scientific equipment that was to accompany the expedition. Most of the stores were bought in England, and all the Alpine equipment, including skis and snow-shoes, rope, crampons, and Alpine tents; the ordinary tents and a certain amount of food stores were bought in India. The scientific equipment included maximum and minimum thermometers, black- and bright-bulb solar radiation thermometers, hypsometers, George barometer, and aneroids in pairs to read from 15,000 to 22,000 and from 22,000 to 30,000 feet. The photographic equipment consisted of three stand cameras, one $7\frac{1}{2} \times 5$ and two quarter-plate, all fitted with telephoto attachments. There was also a Panoram

Kodak and several small Kodaks for use at great heights, where it would be impossible to carry up the larger cameras. The Imperial Plate Company kindly presented all the dry-plates for the expedition. The members of the expedition left England at different times, arranging to meet at Darjeeling by the middle of May, when it was hoped that the expedition would be able to start. Mr. Raeburn was the first to arrive there, as he had gone ahead to collect coolies for the expedition. For high climbing a special type of coolie is needed, one who is strong and hardy and does not mind the cold and is also accustomed to live at great heights. The type of man who best fulfils these conditions is the Sherpa Bhotia, who comes from the north-east of Nepal from the districts that lie to the south of Mount Everest. He is a Buddhist by religion, and though at times quarrelsome and rather too fond of strong drink, yet he proved a very useful and capable type of man, who could be rapidly trained in snow and ice craft, and who was not afraid of the snow or the cold. We also picked up a few Tibetans from the Chumbi Valley on the way, and these proved to be as good as the best of the Sherpas; they were less trouble to manage, and could equally well carry loads at great heights. These coolies were all fitted with boots, and very difficult some of them were to fit with their broad feet—as broad as they were long. Blankets, cap comforters, fur gloves, socks, and warm clothing were issued to all of them, and for those that had to sleep at the highest camps, eiderdown sleeping-bags were taken. The expedition also took two interpreters with them, Gyalzen Kazi, a Kazi of Sikkim, who came from near Gangtok, and Chheten Wangdi, a Tibetan who had at one time been a captain in the Tibetan Army, and then had been with the Indian Army in Egypt during the War. They proved quite invaluable to the expedition. They were both of them very hard-working, and saved the expedition many thousands of rupees in expense; their tact and knowledge of Tibetan ways and customs were of the greatest use in keeping up the friendly relations established between the expedition and the Tibetans.

Lord Ronaldshay, the Governor of Bengal, showed the expedition every kindness and hospitality, and went out of his way to help it in every way possible at Darjeeling. The stores from England, which had gone round by sea, were unfortunately late in arriving, owing to congestion in the harbour at Calcutta, and insufficient dock accommodation there. However, once they were landed, every one was most helpful, and the Darjeeling Himalayan Railway, which had given a free pass for them over their line, had everything brought up to Darjeeling by May 16.

Arrangements had been made with *The Times* and with certain Indian newspapers to publish periodical telegrams dealing with the progress of the expedition, and though this news was available to all other Indian papers, they took no advantage of it, and preferred to boycott the expedition.

Before going up to Darjeeling I had been to Simla, where I had had

an interview with Lord Reading, the Viceroy, who had shown great interest in the expedition and had given a subscription of Rs.750 towards it. The Commander-in-Chief, Lord Rawlinson, I had also seen, and he had arranged to lend the expedition 100 Government mules. These arrived at Darjeeling early in May and were to be our main transport. The mules were a fine lot, sleek and fat, and we had great hopes of them. On May 18 and 19 the expedition left Darjeeling in two parties, with fifty mules and twenty coolies in each party. Major Morshead had left on May 13, travelling up the Teesta Valley, with his surveyors, and was to meet us at Kampa Dzong. We were unable to take all our stores at once, and left part of them behind, intending to make use of the Government mules in bringing them on later. Throughout the journey across Sikkim the weather was very wet, with heavy rain each day; the mountain tops and ridges were all covered with clouds and prevented our obtaining any views. Owing to its heavy rainfall Sikkim is a country with a lavish growth and a marvellous vegetation; the path that leads across to the Tibetan frontier is a very trying one, as it is a series of steep climbs followed by equally steep descents into steaming tropical valleys. Wonderful butterflies of every shade and hue flitted across the path, scarlet clerodendrons made brilliant patches of colour in the dark green of the luxuriant forest among huge tree ferns. Creepers and ferns hung from every tree; white, orange, mauve, or purple orchids grew among the mosses and ferns on the branches of the trees, and showed up in lovely clumps of colour. We passed big hedges of daturas on the way, 15 to 20 feet in height and covered with hundreds of great white trumpet-shaped blooms, quite 8 inches in diameter and fully a foot in length. At night they gave out a strangely sweet scent and seemed to gleam in the darkness with a curious kind of phosphorescence.

Ever since leaving Darjeeling our mules had been giving trouble, and two or three from each party had to be left behind after each march. After travelling for four days we stopped at Rongli, hoping they might recover after a day's rest. Ten mules had already been left behind and one had died. The next march to Sedonchen was a short one of only 9 miles, but the path climbed from 2700 feet to 7000 feet, and this completely finished the mules. For one party alone we had already hired twenty-two ponies to take some of the loads, and after Sedonchen we should have had to hire ponies to carry their own line-gear as well as all our loads, so that there was now nothing to be done except to send the mules back and rely on what local transport we could get. The marches ahead of us were longer and the climbing steeper than anything we had yet done. We were, however, on the main trade route to Tibet, and had passed hundreds of Tibetan mules coming down from Tibet laden with bales of wool and others returning with rice, grain, and cloth bought in exchange. We were, therefore, able to pick up sufficient mules to carry us to Yatung; if we had taken the shorter route up the Teesta valley this would have been impossible, as

villages there are small and there is practically no transport passing along that route.

The path is really only a steep stone causeway up the mountain side, a regular *via dolorosa* and most unpleasant to walk upon; but probably anything else would be washed away by the torrential rain that falls here during most of the year. Leeches abounded here, sitting up at the end of every leaf and fern and waving at the passers-by. From Sedonchen to Gnatong the path climbs 5000 feet in the first 5 miles, and as we rose higher we entered into the rhododendron forests after passing through the zone of oaks and magnolias. The rhodendrons at this time of the year were a glorious sight. No photograph could do justice to the scene—it needed a painter at least. The hillside was a blaze of colour—rhododendrons, orange, red, deep crimson, pink, white, cream-coloured, formed a glorious mixture of colours. Every yard of the path was a pure delight. Now appeared grassy fields carpeted with primulas and many others of the purely Alpine plants. Gnatong was a very wet and cold spot with a rainfall of 180 inches, and on the next day we crossed the Jelep La, 14,390 feet, in pouring rain. This was the frontier between Sikkim and Tibet, and on going a few hundred feet down on the Tibetan side we emerged into fine weather with blue skies, having left the rain behind us on the Sikkim side. Everywhere were primulas and rhododendrons, the former appearing the moment the winter snow had melted from the ground. It was a steep and a stony descent of over 5000 feet into the Chumbi Valley, but the rhododendrons in the great forest of fir trees showed up splendidly, the big pink blooms of *Aucklandi*, the orange bells of *cinnabarinum*, and many a white and yellow one too, in striking contrast to the dark green of the firs. We now met birch, sycamore, and willows, all pale green, with the tender green of early spring, white spiræas and clematis, yellow berberis, white and pink roses, purple iris, and a mass of other wild flowers. The Chumbi Valley is one of the most fertile and prosperous valleys in all Tibet; the houses are large and well built, reminding one very much of Tirolese villages. The rainfall here is but a quarter of that which falls on the other side of the Jelap La; potatoes, barley, wheat, apples and pears all grow well here. The air everywhere at this time of the year was scented by the wild roses. From Yatung to Phari was 28 miles, two days' easy march up the Chumbi Valley. We visited the Galinka and Donka monasteries on the way, both containing enormous prayer-wheels in which they said there were over one million prayers. Each time the wheel is turned a bell rings, and one million prayers have ascended to heaven. In other places we met prayer-wheels turned by water brought down in irrigation channels, and again in other parts the wind was used to do the same work, a kind of anemometer being fitted up to catch the wind. This latter was, perhaps, the most constant, as the wind blows both summer and winter in Tibet, whereas for six months in the year the water is frozen, and the water-wheel is silent

and can offer up no prayers. In the Donka monastery was a famous oracle, a regular Delphic oracle who was consulted far and wide, and his oracles had a great reputation for truth. Here we were given the usual Tibetan tea, poured out into agate and silver teacups and made with salt, tea, and butter, all churned up together. On a cold day this was a warming drink, but I never much took to it as a beverage, though I had to take many cups of it during the next few months and had to pretend to enjoy it.

Phari is a very dirty village, with a stone fort, and is situated at a height of 14,300 feet. It is always a cold windy spot, but it is an important trade mart, both to India and across the Tremo La to Bhutan. It lies at the foot of the sacred peak of Chomolhari—a very beautiful mountain, just under 24,000 feet, which stands at the entrance to the real Tibet, where the great plains and rolling downs begin with their far distant views. We left Phari on May 31 with a most marvellous collection of transport animals, comprising donkeys, bullocks, mules, ponies, and yaks. There is a short way from Phari to Kampa Dzong which takes only three days, but we were told that it was too early in the season to use that road, and that we would have to take the long way round. We afterwards found out that this was a lie, and that they had sent us the long way round in order to be able to charge us more. We had not yet got accustomed to Tibetan ways.

From Phari to Kampa Dzong by the long route took us six days. For the first two days we followed the ordinary trade route to Gyantse, over the Tang La, 15,200 feet, through Tuna to Dochen, keeping at a height of 14,800 all the way. Chomolhari was a magnificent sight the whole time, with its 7000 feet of precipices descending right on to the Tuna plain. Near Dochen was the large shallow lake of Bam-tso, a lake with the most lovely colours, the shades varying from deep blue through purple to a light blue-green. In other parts of it the waters were quite red from a weed that grew in it, and in the still morning light the whole of the range of glacier-covered mountains that formed the background to the picture were reflected in its calm waters and formed a charming picture. Many bar-headed geese were seen swimming about, also some Brahmany duck and a few terns. On the plains roamed herds of Kiang, the wild horse of Tibet, and many Goa, the Tibetan gazelle, were feeding there, but the latter were very wary and would not allow us to get within 500 yards of them. It was at Dochen that our cook tried to boil a tin of fish without opening it first, and when he tried to open it afterwards when it was hot, to his surprise and fright, it exploded like a bomb in his face, and he and all his assistants in the kitchen were covered with small pieces of fish.

From Dochen we crossed the Dug Pass, 16,400 feet, to Khe, which was the site of the once-important town of Khe-tam. In those days the Kala-tso must have extended right up to it, but everywhere were traces of rapid desiccation. Ruins extended for more than a mile in every direction, and some of the buildings must have been of considerable size,

but now there is no water in the valley, and all we could get that night came from a very dirty and muddy pond that was nearly dried up. From here we marched to Kheru, and camped at 15,700 feet with some nomads who were very friendly. The days were very warm, but at nights there were still sharp frosts. From Kheru there was a longer march of 16 miles to Tat-sang, crossing two small passes of 16,450 and 17,100 feet. Tat-sang lies at a height of 16,000 feet on the edge of a broad plain, where there were some excellent springs full of fish, and below a small nunnery, which stands on a commanding rock. That night, again, there was a sharp frost. The next day's march to Kampa Dzong led for 12 miles along a barren and dry valley to a pass 17,300 feet, and then gradually descended through a curious limestone gorge to Kampa Dzong, whose walls suddenly appeared towering above us on the cliffs. We passed many iris, light and dark blue, growing in the valley, and a curious pink trumpet-shaped flower that came straight out of the sand. Game was plentiful along the route, and I shot a gazelle and an *Ovis Ammon* (*Hodgsoni*) on the way. Here we met Morshead and his surveyors, who had come up the Teesta Valley and over the Serpo La.

Several of us, ever since leaving Phari, had not been feeling well, and had had stomach troubles owing to the change of climate and bad cooking on the part of our cooks. It took most of us some time to get acclimatized to the changed conditions. Dr. Kellas, however, instead of getting better, gradually grew worse and weaker every day, until on the last march before reaching Kampa Dzong, while being carried in a litter over a 17,000-feet pass, his heart failed him, and he passed quietly away. The following day we buried him at Kampa Dzong, within sight of the three great mountains he had climbed in Sikkim—Pawhunri, Kinchenjhow, and Chomiomo, and in view of Mount Everest, which he had so longed to approach. Mr. Raeburn, too, had been gradually getting worse, and there was no other alternative but to send him down with Mr. Wollaston to Lachen and put him under the care of the missionaries there until he could recover. This was a very serious blow to the expedition, the loss of two of the members of the climbing party.

After Kampa Dzong our route lay across broad plains and along the flat and swampy valley of the Yaru with the snowy chain of the Himalayas to the south of us; from these heights, for we were about 15,000 feet, they did not appear nearly as imposing as they do from the south, and for the most part the northern slopes were not as steep as those on the south. Game was plentiful all the way to Tinki Dzong, and we passed many ponds covered with teal, duck, and bar-headed geese. In these flat valleys the midges were very troublesome all day, surrounding us in clouds. Tinki Dzong was a picturesque old fort, situated on the banks of a large pond that swarmed with bar-headed geese, Brahmany duck, and teal. They were wonderfully tame and came waddling round our tents, knowing no fear of man, for they had never been shot or killed

here. For some years a Lama, who had been sent from Lhasa, had lived here and made it his special object to tame all the wild animals around. The Jongpen rode out to meet us and escorted us to tents which had been pitched for us, where he had ceremonial tea, sweetmeats, and chang —Tibetan beer—all ready for us. The Jongpen was very Mongolian in appearance, and was dressed in fine embroidered Chinese silks, and proved a most obliging and courteous host, presenting us with a couple of hundred eggs and four sheep. There were several large monasteries and prosperous-looking villages tucked away all around in the recesses of the hills. The barley here was just beginning to come up, for in Tibet it can be grown and ripened at heights of over 15,000 feet, and during the summer months I saw some of the finest crops that I have seen anywhere. It is nearly all irrigated, as they do not seem to put much faith in the rain.

On June 11 we left Tinki, and had the usual trouble in starting. Some forty-five families were supplying us with transport, and as each wanted the lightest loads for their animals, there was a babel of noise and nothing was done. The headman eventually settled the squabbling by taking a garter from each family, and after mixing them up, laid one on each load, and whover was the owner of the garter had to take the load. Crossing the Tinki Pass we descended again into the Yaru Valley at Chusher Nango, passing on the way a curious dwarf gorse which carpeted the valley with yellow. Our yaks here proved very wild, and the plain was soon strewn with loads flung off by them as they careered away, tail in air, in every direction. We forded the Yaru here by a ford 3 feet deep and some 80 yards wide, and soon afterwards came to the fine country house of Gyanga Nangpa, which was the home of the Phari Jongpen. He rode out to meet us, and provided us with a very solid meal of soup and Tibetan dumplings with a chillie sauce. As we were given fifteen dumplings apiece we found some difficulty in making room for these. Europeans had never been seen before in any of these parts since leaving Kampa Dzong, so everywhere we were objects of the greatest interest to all the inhabitants who flocked out to see us.

Our next march proved a more exciting one, as after fording the Yaru again we had to cross a wide sandy plain full of shifting quicksands. When we arrived there a violent sandstorm was blowing, which our guides said would make the crossing easier. So off we started, dressed as though for a gas attack, with goggles over the eyes and with mouth and nose covered with handkerchiefs and mufflers. The sand was blowing in great clouds from off the sand-dunes, through which we wound our way, and under one we found some of our coolies halted and quite lost. After leaving the sand-dunes we had some wide stretches of wet sand to cross, over which the dry sand was blowing in smoke-like wisps, so that the whole ground appeared to be moving. In places where the wet sand shook and quivered we hurried on as fast as possible, and eventually we

got everything over in safety. It was too late now to go on, so we camped in a howling gale among the sand-dunes, and it was many days afterwards before we got rid of the sand which had penetrated everywhere.

Close to this camp the Bong Chu and Yaru rivers meet and flow south, cutting their way through the great Himalayan mountain range. Much to our surprise, there suddenly appeared just before sunset, and far away down the valley over the clouds, a lofty and very beautiful peak. This we eventually decided must be Mount Everest, and the next morning we were able to prove this was so by climbing one of the hills to the west of the camp, from which we could see the whole range of the Himalaya to the south of us. Our drivers called this peak Chomo-uri, the Goddess of the Turquoise Peak, but this can only be a very local name, as Everest is known and called by the Tibetans Chomo-lungma, Goddess Mother of the country. This is the official name in Lhasa, and this name was known throughout the country, so that this is apparently the correct Tibetan name for Mount Everest. From this point we now entered the valley of the Bhong Chu, and this we followed up to Tingri. Major Morshead and his surveyors were kept very busy all the time, mapping the country as they went along, for they were travelling now in unsurveyed country. From one peak to the north of the Bhong Chu we had a very extensive view, stretching from the snowy ranges beyond Chomolhari and 120 miles to the east of us to Kanchenjunga, and then on to Makalu and Everest, and from there passing on to the high snow peaks west of Everest and to Gosainthan, a range of some 250 miles of snow peaks; but above them all towered Mount Everest, several thousand feet above its neighbours.

Three days' march brought us to Shekar Dzong, where was the head-quarters of the district with two Jongpens. There was also a large monastery here containing 400 monks. Shekar was a most remarkable place, on a rocky hill like a gigantic St. Michael's Mount. The town is at the base of the hill, but the monastery, consisting of innumerable buildings with narrow streets, was literally perched on stone terraces built out from the rocky sides of the hill and connected by walls and towers with the fort, which was built still higher up, and this again was connected by turreted walls with a Gothic-like structure at the summit, where incense was freely burnt every morning. Immense crowds came to see us and were most embarrassing in their attentions. While we were here we visited the monastery, which was a very rich one. In the largest temple, which, like all Buddhist structures, was very dark, were several life-sized gilded statues of Buddha, covered with precious stones and turquoises, and behind these was a colossal statue of Buddha fully 50 feet high. Round the temple were eight curious figures, about 10 feet in height, and dressed in quaint flounce dresses, which were the guardians of the shrine. From the entrance to the temple we climbed up a steep staircase, almost in complete darkness, until we came out on a platform almost opposite the gilded face of the great Buddha. Here were offerings of grain and butter and

some exquisitely carved bowls and teapots of silver. The abbot of this monastery was the reincarnation of a former abbot, and was looked upon as an extremely holy man. He had spent sixty-six years of his life in this monastery, and all the monks seemed to adore him for his gentle and charming personality. His attendants with much difficulty persuaded him to be photographed, as they wanted to have some picture of him, for they said that his time on earth could now only be short. They dressed him up in some beautiful gold brocades, and priceless silk hangings were put up for a background. This photograph proved afterwards most useful, and people hundreds of miles away used to beg for a print of it, as they put it in their shrines and worshipped it and burnt incense before it, and I could not give any one a more welcome present than the picture of the old abbot of Shekar-chöde.

Two days' march from here brought us to Tingri, which was a large village and trading centre, situated on a small hill in the middle of the great Tingri plain. This was to be our first base while reconnoitring the north-western approaches to Mount Everest. We could get no information about the country to the south of us, so that it was necessary to send out parties in different directions. Information on any subject was always hard to get in Tibet. Most of the people knew nothing beyond their own village, and of those that had travelled further no two would tell you the same story. It was the same with distances; they would have no real measure of distance or time. It would be a long day's journey or a short one, and for short distances it was expressed by cups of tea, which means the time that it would take to drink one, two, or three cups of tea. The representative of the Depon received us at Tingri, and put at our disposal the old Chinese Rest House, where we made ourselves quite comfortable. We had rooms in which to put away our stores, and another room we turned into a dark room to develop all the photographs that we were taking. It had taken the expedition just one month to get to Tingri from Darjeeling.

No time was lost, as it was not known when the monsoon might break, and how strong it might be in Tibet, and on June 23 Mallory and Bullock started off to find the easiest method of approaching Mount Everest from the north-west. Mount Everest was clearly visible from Tingri, about 40 miles away, and across a low range of hills and to the west of it were some fine snow peaks 25–27,000 feet in height, which dropped down to the Khombu Pass. It was just possible that a glacier might come from Mount Everest and join the Kyetrak River, so the following day Major Wheeler and Dr. Heron started off to go towards the Khombu Pass. From now on Dr. Heron was on the move all the summer, sometimes with one party, sometimes with another, and often by himself studying the geology of all the valleys and mountains. He travelled over more country than any other member of the expedition. Major Wheeler, too, began his photographic survey from the Khombu

Pass, and most of the summer he spent by himself in lonely camps 18–20,000 feet high. The weather was very provoking, and often he would spend day after day, over 20,000 feet, on the top of a mountain in bitter cold and driving snow, waiting for the clouds to lift, to enable him to take his photographs. I think that he had the hardest and most trying time of all of us, and deserves the greatest credit for his work.

On June 22 Mr. Wollaston rejoined the expedition, after having taken Mr. Raeburn down to Lachen and handed him over to the care of the lady missionaries there. After his arrival I was now able to go away for a few days, and see personally where the various parties were and the general lie of the land, and I also wanted to find a place for our second base when we were reconnoitring the other side of Mount Everest. I first went and joined Major Wheeler and Dr. Heron at Kyetrak, and climbed up to the Khombu Pass—a fine glacier-covered pass 19,000 feet—leading into Nepal and across which a certain amount of traffic comes. It is always a dangerous pass, but early in the season they appear to take yaks over it. To the east towered up the great cliffs of the 26,800-foot peak, and to the right were the icefalls of Chorabsang. From here, with Dr. Heron, we crossed over the Pusi La or Marmot Pass (17,700 feet), a quite easy pass into the Rongshahr Valley and down to its interesting gneiss gorges. The Tibetan frontier in many places extends for several days' march south of the main watershed of the Himalayas, as it is easier to get from Tibet over the passes into the upper reaches of the valley than it is from Nepal. At a certain distance down the valleys they narrow into steep precipitous gorges up or down which the going is very difficult and often impassable in the rainy season, as the rivers are quite unfordable. This is the case with the Nyanam Valley, the Rongshahr Valley and the Arun Valley. On the south side of the passes there is a considerable rainfall and the vegetation becomes quite luxuriant. Near Tazang the white roses covered the hillsides, while spiræas, small yellow and white rhododendrons, yellow primulas, wild gooseberries and currants grew everywhere, and the shady side of the hills were covered with forests of birch, while juniper covered the other slopes that faced south.

Owing to the amount of juniper which grows in it, and which is very aromatic and used as incense, the valley is looked upon as a sacred one, and there were several hermits that lived here in caves among the rocks. The nearest village supplied them with food, and morning and evening clouds of incense used to ascend from the mouths of their caves. After ten years of meditation the anchorite is supposed to acquire great holiness and to be able to support life on ten grains of barley a day. There was a female anchorite here, they told us, who had lived to 138 years, and was greatly revered. She forbade any killing of animals, and hence we found the wild sheep everywhere very tame. After returning to Keprak we travelled east to Zambu, a prosperous-looking village, owning some 3000 yaks, and with fine views looking up the Rongbuk

Valley to Mount Everest, which was now only about 20 miles away. This valley led apparently right up to the foot of the giant precipices that come down from its north-western face. A large and unfordable glacier stream came down this valley, but at the monastery of Chöbu, 3 miles from Zambu, there was a foot bridge across which the loads were carried by hand, while the yaks were swum across the river. Some of the yaks preferred to stop on an island in the middle of the stream. Throwing stones at them was no use as they refused to budge, but at length some one produced a sling, and the stones thrown by this method evidently stung the animals considerably more and produced the required effect. The Rongbuk Valley was wild and gloomy, with great cliffs coming down to the muddy glacier stream, but it was a strangely holy valley, too, for at a height of 16,500 feet there was a large monastery, and besides the inhabitants of the monastery they told us there were between three and four hundred hermits and nuns living in little solitary cells or caves. Here, far away from the outside world, under the shadow of the great precipices of Mount Everest, they could meditate in peace and in perfect seclusion. All the wild animals and birds in this valley were wonderfully tame. With my own eyes I watched the wild sheep coming down in the early morning to the hermits' cells and being fed not 100 yards from our camp, and I walked up openly to within 20 yards of a herd of burhel and they showed no signs of fear or paid the slightest attention to me. The rock pigeon would come and feed out of our hands, and so it was with all the other wild birds.

We found the Alpine climbers in a camp further up the valley, on a sunny terrace about 18,000 feet, above the left bank of the Rongbuk Glacier, and commanding magnificent views of Mount Everest about 7 miles away at the head of the valley. From here for a month they were able to train their coolies in snow and ice work, and to explore the side glaciers and the great spurs that come out to the west and north-west and which appeared so very impossible. At first, and up to July 7, the weather remained pretty fine; but then the monsoon broke and rain and snow hindered the work of reconnaissance very much and made all high climbing impossible. From this point Dr. Heron and I retraced our steps to Chöbu, and then in three marches, crossing the Doya La on the way, we reached Kharta and the main Arun Valley, or Bhong Chu, as the Tibetans call it as long as it remains in Tibet. The people here were at first very frightened of us. Villages were quite deserted when we approached, but after a while they crept back one by one. The Alpine flowers on the Doya La were exceptionally beautiful. The lovely blue poppy abounded and grew in clusters everywhere; pink, yellow, and white saxifrages covered the rocks, and several varieties of gentian were just beginning to come out. The Doya La marks a distinct barrier, the country to the north being barren, while on the south the moister currents of air penetrate up the Arun Valley and its tributaries, giving it a distinctly damper climate. This was very noticeable in the vegetation as we descended—

rhododendrons, willows, juniper, roses, clematis, currants, abounded, and the ground was in places carpeted with yellow and sweet-scented primulas.

After much trouble we at length found Kharta, for the old maps here were hopelessly wrong. It was really a large collection of villages, near where the Kharta River ran into the Arun. We rode up to see the Jongpen, who lives in the village of Kharta Shigar, some 3 miles up the Kharta Valley. He had a large Chinese tent pitched for us in his garden, which was well sheltered and shady with willow trees all round, and containing a large painted water prayer-wheel under a great poplar tree, turned by a gurgling little stream that ran through the garden. The Jongpen was quite a young man, though he had been there for some years, and was most friendly and hospitable. He insisted on giving us all our meals, but we were getting experienced now in the use of chop sticks, and the Tibetan cooking was often better than that done by our own servants. We were able to look round for a suitable place for our second base camp, as it would be necessary to explore the upper Kharta Valley and another valley that they told us about, that lay to the south of it. We eventually selected a house that stood all by itself on an old river terrace, and was surrounded by a shady garden of poplars and willows. The rent we had to pay for the house and garden amounted to 3½*d.* a day; but living is cheap in Tibet, and you can get a house-servant there for 2*s.* 8*d.* a year!

The rains now broke in earnest, and we had a very wet journey back to Tingri, going to Lumeh, with its huge poplar, 40 feet in circumference, and crossing a dangerous ford over the Rongbuk river higher up at Tashi Dzong; but I got back in three days, riding 36 miles the last day in pouring rain. During my absence Major Morshead had been busy surveying the country to the north of Tingri, and on my return he and Mr. Wollaston started off on a journey of exploration to the south-west, having had an invitation from the Jongpens at Nyanam to visit them, and they were able to see the great peak of Gosainthan and Gaurisankar, which was for a long time confused with Mount Everest, though over 20 miles away from it and 5000 feet lower. It was a very striking and beautiful peak. They also visited Lapchi Kang, where the poet Mila Rapa had lived and which was a great place of pilgrimage. Its name was known far and wide, and some people even applied this name to Mount Everest. The weather, however, unfortunately spoilt their trip, as it rained nearly all the time. But Mr. Wollaston managed to collect many natural history specimens and a great variety of new flowers. At Tingri, too, during this time, we had heavy storms of rain and thunder every night, fresh snow coming down as low as 15,000 feet; but most of it melted again during the day. The plains around Tingri were rapidly becoming marshes and the rivers soon became unfordable. The storms always formed to the north of us along the Sipri limestone ridge and the watershed between the Brahmaputra

and Bhong Chu, and then gradually worked down towards the south. Fine weather came to us from the south, and when the south wind blew the rain stopped. It was seldom that the monsoon clouds brought rain directly to us. Every evening at Tingri we had brilliant lightning and loud thunder to the north, and our house proved to be very leaky. The rain poured in through the mud roofs.

On July 24 we started moving all our stores from Tingri to Kharta, and our first march was to Nezogu, where there was a bridge over the Kyetrak River. A couple of inches of snow fell during the night, and many of us who did not put on snow goggles soon enough suffered much the next two days from snow blindness. Wheeler, who had finished his survey of the Keprak and Khombu valleys, accompanied me as far as Chöbu, where he started to go up the Rongbuk Valley. Here he remained for a month, having a very trying time with constant bad weather. Mallory and Bullock, finding the bad weather too much for them, joined us and came along to Kharta, and their coolies were also in want of a rest. From Chöbu to Rebu was a pleasant march through a fertile valley full of fields of barley, peas, and yellow mustard, and the wild flowers were very beautiful along the irrigation channels—a black clematis, blue monkshood, and delphinium predominating. The next day we crossed the Doya La, and on the 28th reached Kharta, where we established our camp in the garden belonging to the house that we had hired, the house itself being used for all our stores and for a dark room. Here we were only at a height of 12,300 feet, and the valley was green with fields of peas and barley. Just below us flowed the Arun, now a majestic river over 100 yards wide, and a mile lower down it entered into its great gorges, where in the course of the next 20 miles it drops from 12,000 feet to 7500 feet, a fall of over 200 feet in the mile. Every day the monsoon clouds came up through the gorge in thin wisps, but melted away always at the same spot, and though it poured with rain a mile below us, yet every day with us the sun shone brightly and it was very rare for any rain to reach us. Twenty miles away to the north again were heavy clouds, and storms and rain fell there daily, so that we seemed to be in a dry zone between the two storms. The forests of fir and birch came up to the limit of the rainfall, and then ceased suddenly when the rain stopped a mile below us.

On August 2 Mallory and Bullock left Kharta to explore the eastern approach to Mount Everest. Neither the Jongpen nor any of the inhabitants could tell us where the Kharta river had its source, and whether it was possible to get to Mount Everest that way. They said, however, that in the next valley to the south it was possible to do so. I followed the Alpine climbers a couple of days later, as Mr. Wollaston and Major Morshead had returned from their trip to Lapchi Kang. After going for 7 miles up the Kharta Valley, which is very fertile, with every level space filled with barley-fields, and containing numerous villages and monasteries,

we turned up a side valley and then crossed over a chain of mountains to the south by the Langma La, a pass 18,000 feet in height. This led us into the wonderful Kama Valley, a valley unexcelled in beauty anywhere in the Himalayas, with the most stupendous scenery—gigantic rocky cliffs towering up to heaven, and immense cliffs of ice torn and riven, breaking off and falling with a thunderous roar far down into the valley below; there were smiling pastures right up amongst the ice and snow, with fields carpeted with many varieties of gentian; rhododendrons, birch and fir trees surrounded some of the lower glaciers, and forests of some of the most magnificent fir trees grew in the lower parts of the valley, the whole forming a combination of beauty not often seen.

At the extreme end of the valley towered up Mount Everest with its great buttresses forming a huge semicircle, and like a great snake, the Kangshung glacier, with its bands of black moraine, crept up to the foot of the rock walls and cliffs that formed the eastern side of Mount Everest. It did not need a long survey of these faces to satisfy the Alpine climbers that there was no practicable route up this side, but there was still an untried approach up the Kharta Valley, and to this valley they now turned their attention. But before we deal with the first reconnaissance of the Kharta Valley I should like to discuss the Kama Valley more fully; it was so very beautiful that I paid three visits to it at different times. From the upper Kharta Valley at the end of September, I paid my third visit with Major Wheeler and Mr. Wollaston. We crossed over a high pass well over 20,000 feet, and descended into the head of the valley. The weather was fine, and we were able to get some good photographs of Everest and Makalu—the latter a mountain only a little over 1000 feet below Mount Everest—yet a far finer mountain to look at and far more imposing. I was able to climb up on to a ridge between the two peaks, whence I got some superb views of the incredibly narrow peaks of Makalu, with its cliffs and formidable precipices often too steep even to be lightly powdered with snow. To the south we looked down over range upon range of snow mountains in Nepal. In the Kama Valley, Makalu is the most astonishing spectacle—its terrifically steep precipices descend sheer for 11,000 feet into the valley, and huge buttresses of perpendicular black rock support it with jagged black spires and towers. The Tibetans do not know the name of Makalu, but call the mountain Chomo Lönzo. From the northern peak the Kangdoshung glacier pours straight across the valley, forcing the stream that rises on Mount Everest itself to go under the glacier, entering it in an enormous black cavern. Rhododendrons, willows, mountain ash, blue poppies and iris now abound, and a few miles lower down begin the birch trees and the juniper, which grow with the greatest luxuriance, and in the autumn I never anywhere saw such beautiful colouring as the scarlet of the mountain ash and berberis, the yellow and gold of the birch and willows, and the deep red of the wild roses.

Towards the end of August, while waiting for the weather to improve,

Mr. Wollaston and I crossed over the Chog La and dropped down to Sakeding (the pleasant terrace), a small trade mart a little lower down in the Kama Valley, in order to pay a visit and investigate the lower parts of the valley. Here we entered at 12,000 feet into the zone of the real forests. Here were juniper trees of a size quite unknown, with stems 20 feet in circumference and rising for 50 and 60 feet without a branch. Then a little lower down we entered into the zone of the silver fir (*Abies webbiana*), where the trees grow 100 feet and more in height and with a girth of over 25 feet, and a little lower down at 9–10,000 feet the lovely feathery *brunoniana* grew over 150 feet in height, and with trunks over 30 feet in girth. In these zones grew also the great rhododendrons, *argenteum* and *Falconeri*, for here was a climate of constant rain. These high mountains seemed to draw up the monsoon currents towards them, and every tree and bush was covered with long grey lichens that hung down and gently swayed in the wind; the hillsides were running with water and the path was a morass of black leafy mud, except where logs had been laid down on which to walk. Such conditions were favourable to leeches, and they abounded in this valley and to heights over 12,000 feet. They had evidently never tasted European blood, and were anxious to do so, thinking that we were a new kind of food and a great delicacy, for they climbed up the tent walls, on our clothes and legs and faces; they got on to our plates and cups and into our food, and we never knew when we might not meet them. We travelled down to where the Kama River joins the Arun River, at a height of 7500 feet, below the first great gorges of the Arun and some 20 miles below Kharta. All this country is still in Tibet, as the Nepal frontier runs along the Everest–Makalu Ridge, and then continues eastwards, following the crest line of the ridge down to the spot where it joins the Arun. The ridge is crossed by one low pass of 14,000 feet, called the Popti La, and across this pass a certain amount of trade is carried on with Tibet by coolies during seven months of the year. For five months the pass is closed by snow, but chillies, dyes, and rice are sent over from Nepal and are exchanged at Sakeding for salt. It is all done by barter and no money changes hands.

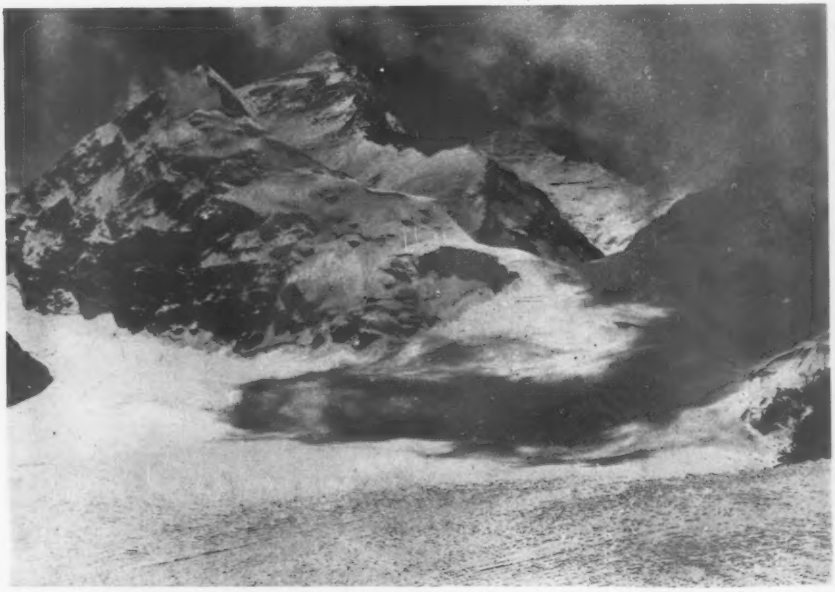
Meanwhile Mr. Mallory and Mr. Bullock had been joined by Major Morshead, and had gone up to the headwaters of the Kharta Valley, and, after exploring it under bad conditions of weather and with very soft snow, had decided that there was a practicable means of getting on to Mount Everest by this route. The rainy season, however, was still in full swing; far more rain had fallen all through Tibet than we had ever expected to meet; the rivers everywhere were unfordable now, and all the bridges by which we had crossed in the spring had been washed away, so that there was nothing to do but wait until the weather improved. About the beginning of September the weather showed signs of improvement, and Mallory, Bullock, and Morshead moved up to the advanced base camp up the Kharta Valley, which was situated at a height of

1. LINGTREN PEAKS, HEAD OF RONGBUK VALLEY, BETWEEN THE RONGBUK AND WEST RONGBUK GLACIERS

2. LOOKING DOWN WEST RONGBUK GLACIER ACROSS THE RONGBUK GLACIER TO THE PEAKS OF THE NORTH RIDGE

Phot. by G. L. Mallory

3. MOUNT EVEREST, NORTH-WEST RIDGE, WESTERN CWM ON EXTREME RIGHT AND LINGTREN PEAKS



4 MOUNT EVEREST AND END OF NORTH-WEST RIDGE WITH SNOW PASS LEADING TO WESTERN CWM

Phot. by G. L. Mallory

5. PUMORI AND LINGTREN-NUP, LOOKING SOUTH ACROSS WEST RONGBUK GLACIER

6. LOOKING SOUTH INTO NEPAL FROM THE SNOW PASS LEADING TO THE WESTERN CWM GLACIER

Phot. by G. L. Mallory

7. THE CHANGA LA FROM THE RONGBUK GLACIER HEAD

8. KARTSE AND MAKALU FROM THE WEST

Phot. by G. H. Bullock

9. ENTRANCE TO EAST RONGBUK VALLEY FROM WESTERN SLOPES OF RONGBUK VALLEY: THE UNNAMED PEAK IS THE "LIGHT ROCK PEAK" PHOTOGRAPHED BY DR. KELLAS FROM THE KANG LA

Phot. by G. L. Mallory

Changtse

Rongbuk Glacier

10. THE LOWER REACHES OF THE EAST RONGBUK GLACIER

Summit

11. LOOKING UP THE EAST RONGBUK GLACIER

Phot. by Capt. Wheeler, R.E.

12. THE NORTH-EAST ARÊTE OF MOUNT EVEREST

Phot. by A. F. R. Wollaston

Kangchenju

14. CAMP ON LH

Kharta Valley

Makalu

15.

13. PANORAMA FROM KAMACHANGRI (21,300 FEET)

CAMP ON LHAKPA LA (22,500 FEET), CHANG LA. CHANGTSE AND HEAD OF EAST RONGBUK GLACIER

15. PANORAMA FROM PEAK NORTH OF ADVANCED BASE CAMP, KHARTA VALLEY

Pethangtse Summit Khartaphu

Changtse

ER East Rongbuk Glacier

Khartichangri

Phot. by Col. Howard-Bury, D.S.O.

16 CHOMO LÖNZO, MAK

Makalu

LÖNZO, MAKALU AND COUNTRY SOUTH OF MOUNT EVEREST FROM RIDGE AT 21,500 FEET SOUTH OF

Pethang Ringmo Langma La

17. PANORAMA OF THE KAMA VALLEY FROM SOUTH OF THE KANGSHUNG GLACIER

ALU AND COUNTRY SOUTH OF MOUNT EVEREST FROM RIDGE AT 21,500 FEET SOUTH OF KAMA VALLEY

PANORAMA OF THE KAMA VALLEY FROM SOUTH OF THE KANGSHUNG GLACIER

Phot. by Col. Howard-Bury, D.S.O.

18 LOOKING BACK FROM THE LAST CAMP TO THE LHAKPA LA

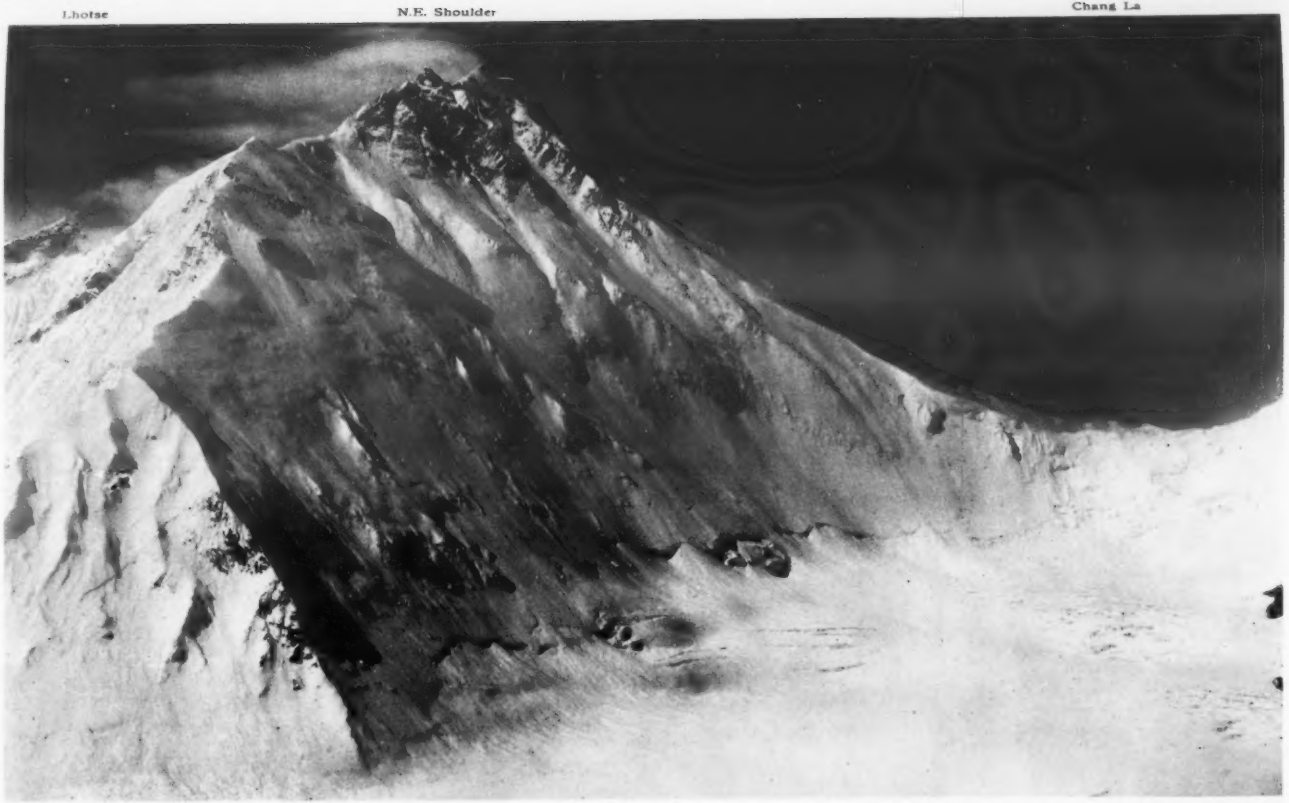
19. LOOKING OBLIQUELY UP THE NORTH FACE OF MOUNT EVEREST FROM THE CHANG LA

Phot. by G. L. Mallory

20. WIND BLOWING SNOW FROM THE MOUNTAIN, SEPT. 1921, FROM ABOVE 20,000 FEET CAMP

Phot. by A. F. R. Wollaston

Lhotse N.E. Shoulder Chang La



21. DETAIL OF NORTH-EAST ARÊTE AND NORTH FACE FROM THE LHAKPA LA East Rongbuk Glacier

22. GAURISANKAR FROM THE WEST

Phot. by A. F. R. Wollaston

over 17,000 feet. Wollaston and I arrived there on September 6. Our tents were pitched in some little grassy hollows, which formed a perfect Alpine garden, as they were carpeted with gentians and saxifrages, and all around grew a host of other lovely little Alpine plants. Unfortunately the weather broke again, and until September 19 we had constant falls of snow every day. The time was spent in carrying up fuel and stores to the 20,000-feet camp, so that as soon as the weather improved we might start off at once.

There was a temporary break on the 17th, and with Mallory and Morshead we made one of the most delightful excursions that I have ever taken part in. We started off at 2 a.m. with a full moon shining with the most brilliant light, turning night into day, and we climbed up along the ridge south of the camp which led to a peak 21,300 feet high that overhung the Kama Valley. When we started there were 13 degrees of frost, and, except for the distant roar of the stream far away in the valley, there was no other sound, only an intense stillness. The valleys in Tibet, the great gorges of the Arun, the wooded valleys of Nepal, all lay buried under a white sea of clouds, out of which emerged the summits of the highest mountains, like islands out of a fairy sea. In the bright moonlight mountains like Kangchenjunga, 100 miles away, stood out sharp and distinct, and far away to the south, over the plains of India, was constant lightning. Here on this sharp ridge, at a height of 21,000 feet, with no obstruction to hide the view, sunrise came to us in all its grandeur and beauty. To the west, and close at hand, towered up Mount Everest, still over 8000 feet above us, at first cold and grey, like the dead, and with a sky of the deepest purple behind. Then, all of a sudden, a flash of golden light touched the utmost summit of Mount Everest and spread with a glow of gold all over the highest snows and ridges of this wonderful mountain, while behind the deep purple of the sky changed to orange. Makalu caught next the first rays of the sun and glowed as though alive, and then the white sea of cloud was struck by the rays of the sun and gleamed with colour; then slowly rose and struck against the island peaks in great billows of fleecy white. Such a scene it has seldom been the privilege of man to see, and once seen leaves a memory that the passing of time can never efface.

By September 20 we had all moved up to the 20,000-feet camp, situated on a sunny terrace of stones between two glaciers. Even here a few flowers existed, and every night any food in my tent left unprotected was eaten by some mountain rats, though what they can find ordinarily to eat at these heights I cannot imagine. The nights here were cold, but the days delightfully warm, and the black-bulb thermometer registered sun temperatures of 195° and 197° Fahr. regularly. The sun at these great heights is one of the great foes that we have to contend with. It seemed to exhaust and draw off all one's vitality and leave us limp, and good for no exertion. The whole climate is trying, and the extremes are so great

that your feet can be suffering from frost-bite while you are getting sun-stroke at the same time. It is only the young and thoroughly fit person that can withstand the extraordinary changes of climate and temperature that there are in Tibet, and can acclimatize himself properly to the changed conditions of existence and food.

We had been saddled with a very useless and incompetent sirdar, who was in charge of the coolies; he was a thoroughly untrustworthy man, and was always making mischief; we had sent him away to Kharta to get him out of the way, and once he was gone we never had any trouble with the coolies, who worked most willingly. On September 22 six of us moved up to the Lhakpa La, a col 22,320 feet in height, to which Mallory had been busy carrying up stores; from here the only possible way up to Mount Everest could be seen clearly. It necessitated first a descent of 1200 feet on to a branch of the Rongbuk Valley, and then a steep climb up to the north col, a col that joined Mount Everest with the north peak, a peak some 24,600 feet in height. Mr. Mallory with Mr. Bullock and Major Wheeler went on the next day and reached the col at a height of about 23,000 feet; but the fates were altogether against them, and though the weather remained bright and clear, a north-westerly gale had already set in which made life even at the Lhakpa La camp very unpleasant, and conditions became absolutely impossible for any higher climbing. The whole slopes of Mount Everest seemed to be smoking with the snow being blown about in suffocating whirls and clouds, and with the iciest wind that made breathing almost an impossibility. After the monsoon there seems to set in a strong north-westerly current of air, with the force of a gale at heights over 23,000 feet, and nearly every day afterwards, throughout all our journey back, and right to the end of October, we could see the snow being blown off in great clouds from every peak over 23,000 feet, by a gale from the north-west, which would seem to preclude any higher climbs after the monsoon has ended in this easterly portion of the Himalayas. Tracks of hares, foxes, and wolves were seen in the snow at great heights up to 21,000 feet, and the track of what was probably a large loping grey wolf, which had tracks very like that of a barefooted man, gave rise to the legend of the snow man, which was well known to our coolies. As in many other countries, they have in Tibet a bogey man with which to frighten their children when naughty, and this takes the form of a hairy man that lives in the snow; and when they want to escape from him they must run downhill, as long hair from his head falls over his eyes when he runs downhill, and he is then unable to see, and so they can escape from him. Many such stories they have, and these wolf tracks in the snow, which looked at first sight like human prints, were at once accepted by them as being the tracks of wild men.

Defeated by the continuous gale, Mallory, Bullock, and Morshead, with Raeburn, whom they had picked up at the 20,000-feet camp, returned straight to Kharta, while Wollaston, Wheeler, and I crossed over a pass

opposite the 20,000-feet camp and went round to Kharta after spending a few days in the Kama Valley, where we were lucky in getting some good photographs. It was not until October 5 that we were able finally to get away from Kharta. The autumn colours in the Kama Valley were magnificent, and near Kharta the willows and birches were all brown and gold. The crops of barley and peas had all been garnered, and the people of these villages were very satisfied, as they said that we had brought the rain with us, and that their crops were 50 per cent. better than they were in most years.

We chose another route for the journey back, following up the valley of the Arun or Bhong Chu, as it is called in Tibet. This route was impassable during the summer months, when the rivers were in flood, but now with the snow and ice no longer melting its width was reduced by half, and it was fully 10 feet lower, so that we could make use of the Heath Robinson bridge of twisted hide at Gadompa. Across these ropes each load and person were slowly pulled, and when the Tibetans wished to play a joke on any one they let him slide rapidly down to the centre of the rope, where it sagged just clear of the water; but as a large wave formed in the rapids they had only to pause for a moment to allow the unfortunate passenger, who was helplessly trussed up, to get a ducking in this ice-cold water. At Shilling, near the sand-dunes and the quicksands, we struck our old route and travelled back swiftly along it, as winter in these lofty regions was coming on apace, and between Kampa Dzong and Phari the thermometer fell to zero Fahrenheit, and we had a regular blizzard of snow. This time we came back by the shorter route, so that it only took the caravan three days to get from Kampa Dzong to Phari, but the marches were long, over 20 miles each day, and over 16,000 feet all the time. Darjeeling was reached on October 25, and the expedition of 1921 was over. The expedition had accomplished what it had set out to do. All the approaches to Mount Everest from the north, north-west, north-east, and east had been carefully reconnoitred, and a possible route to the top had been found up the north-east ridge, and it was only climatic conditions that prevented a much greater height being attained this year.

The scientific results have not yet been fully worked out, but in general outline some 13,000 square miles of new country have been surveyed and mapped, part of this by the method of photographic survey and on a large scale; a large number of birds and mammals of all sizes have been collected; the geology of the whole region has been carefully worked out by the indefatigable Dr. Heron, who is at present compiling a geological map of the district, and a series of photographs have been taken of a country quite unknown and containing some of the grandest scenery in the world.

Such, in brief, have been the results of the first year's expedition.

MOUNT EVEREST: THE RECONNAISSANCE

George Leigh Mallory

Read with the preceding paper at the Joint Meeting of the R.G.S. and A.C. on 20 December 1921.

THE reconnaissance of Mount Everest is a long story, and I do not propose to tell it now. It was necessary for our purpose, firstly, to seek in an unexplored country the most convenient approaches to various parts; secondly, by regarding the mountain from many different points of view to come to a correct understanding of its shape, and distinguish the vulnerable parts of its armour; finally, to pit our skill against the mountain wherever an opportunity of ascent presented itself. In the first two objects our task was largely accomplished between June 23, when we set out from Tingri, and August 18, when we first reached the Lhakpa La and looked over into the snow basin, which is the head of the East Rongbuk glacier. The final phase of the reconnaissance occupied the first three weeks of September, and I call it the "Assault," because we intended to climb as far up the mountain as we were able.

We had discovered before the final phase that the summit of Mount Everest was formed by the convergence of three arêtes. The faces which lay between them were clearly seen to be impracticable. The south arête is blocked by the south peak, a formidable crest about 28,000 feet high. The other two arêtes, west-north-west and north-east, are so steep in their lower parts that access is impossible. The only possible line of ascent is to reach the upper part of the north-east arête from the north. Between Everest and the north peak is a high snow col (about 23,000 feet), and it looks possible to get up from here.

The line of approach chosen to this col had been determined by a variety of circumstances, more particularly by the abundance of fuel in the Kharta Valley which had suggested an advance from the eastern side; but this approach would involve the crossing of another snow col, the Lhakpa La (22,500 feet), which we had already reached. Once the snow was firm the way there would present no difficulties.

It had become evident during our reconnaissance in July and August that any serious climbing on the great mountain itself must wait on the weather—if only for the sufficient reason that the labour of carrying loads over unmelted snow would be an unendurable strain upon our coolies. Our plans were based upon the assumption that what the wise men prophesied about the weather would come true. We were promised a fine September. Some time about the beginning of the month the monsoon would end, and then we should have clear days of glorious sunshine and warmth to melt the snow, and cold nights to freeze it; at worst the calm spell would only be broken by a short anger. And so it was arranged

in hope, if not in confidence, to move up on the first signs of improvement. Already, before we came down to Kharta, our advanced base camp had been moved up. It was now situated at about 17,300 feet on a convenient grassy plateau and only a reasonable stage below our 20,000 feet camp, where some light tents and stores had also been left. At these two camps we had, in fact, left everything which we should not absolutely require at Kharta, so that few mountaineering stores would have to be carried up from the base when we came up again. Our first task would be to supply the advanced base with food and fuel, and a start had already been made by collecting here a pile of wood, nominally thirty loads. Transport in any case was not likely to be a difficulty in the early stages. Local coolies could easily be hired, and Colonel Howard-Bury was to follow us up after a short interval with all available strength to help in every possible way.

The first object which our plans must include was, of course, to reach the north col; by finding the way to this point we should establish a line of attack and complete a stage of our reconnaissance. Secondly, we must aim at reaching the north-east arête. In so far as it was an object of reconnaissance to determine whether it was possible to climb Mount Everest, our task could never be complete until we had actually climbed it; but short of that it was important to have a view of the final stage, and could we reach the great shoulder of the arête we should at least be in a better position to estimate what lay between there and the summit. Finally, we saw no reason to exclude the supreme object itself. It would involve no sacrifice of meaner ends; the best would not interfere with the good. For if it should turn out that the additional supplies required for a larger campaign were more than our coolies could carry, we could simply drop them and aim less high.

In organizing the assault we had to consider how our camp could be established firstly at Lhakpa La, or, perhaps, better beyond it at a lower elevation, secondly at the north col, and finally as high as possible, somewhere under the shoulder, one thought, at about 26,500 feet. From the camp on the north col we should have to carry up ten loads, each of 15 lbs., which would provide tents enough and sleeping-sacks and food for a maximum of four sahibs and four coolies. Sixteen coolies were allowed for this task; twelve would, therefore, have to return on the day of their ascent and sleep at the north col; on the assumption that they would require an escort of sahibs, who must also sleep at this camp, four small tents must remain there, making six in all to be carried up to this point.

The lower end of the ladder must be so constructed as to support the weight at the top. It was comparatively a simple matter to provide the earlier camps. The first above the advanced base could be supplied before we moved up to sleep there, the coolies returning on the same day whenever they carried up loads. And the same plan could be adopted for the second at Lhakpa La; only one journey there, I calculated, would

be required before we started from the 20,000-feet camp, and we could then go straight ahead without delay. The crux would lie in the stage from Lhakpa La to the north col. At the most we should have twenty-three coolies, sixteen who had been all along with the climbing party, three whom Wheeler had partially trained, and four more Sherpas, the maximum number being determined by the supply of boots. But it would not be necessary to carry on all the loads from Lhakpa La; and return journeys could be made from the north col, both by those who were not to stay there and by the twelve already mentioned who might fetch supplies if necessary on the final day of the assault. This plan was never executed in its later stages, and we cannot know for certain whether it would have held good. But it may be conjectured in view of our experience that the weakest link would have broken; either an extra day would have been spent between Lhakpa La and the north col, or, if we reached the north col, according to our programme, with the minimum of supplies, the coolies would not have been brought to this point a second time, and the climbing party would have been cut off from its reserves. And, granted the most favourable conditions for the attempt, in asking the coolies to carry loads of 30 lbs. on two consecutive days at these high altitudes we were probably expecting too much of them. It must be concluded, if this opinion is correct, that we had not sufficient coolies for what we intended.

On the last day of August, Bullock and myself were established once again at our advanced base. The weather had not yet cleared, though it was showing some signs of change. But it had been necessary to move up for the coolies' sake. At Kharta they had little to amuse them, and no work to employ their time; they were badly in need of a routine, which was easily enough provided. Besides, I wanted to be ready, and it seemed not too soon to begin carrying loads up to the next camp. There was no occasion for hurry in the event. We were obliged to wait nearly three weeks, until September 19, before moving forward. The delay served no useful purpose. The work of supplying our present needs and providing for the future was sufficiently spread over the long tale of days, but interspersed with more rest and leisure than any one required. It was a blessing to be comparatively a large party. Howard-Bury and Wollaston and also Raeburn had come up on the 6th, Morshead and Wheeler on the 11th, and for two nights Heron was of our company. We kept ourselves fit. But it amused nobody to watch the procession of clouds which precipitated sleet by day and snow by night, and our appetite for adventure could not be stimulated by the days of waiting in so dreary a scene.

When at last the weather cleared, it was evident that the fate of our enterprise would be decided by the sun's power to melt the snow. Before we left the advanced base I had good reason to expect that we should meet adverse conditions, and was so resolved at the same time

that nothing was to be gained by waiting. The coolies were lightly laden up to the first advanced camp, and sufficiently unfatigued to proceed next day. On the 20th, therefore, leaving Bullock to accompany Wheeler, Morshead and I set forth to get fourteen loads up to Lhakpa La. We had one spare coolie who carried no load, and Sanglu, who was now our acting sirdar, four of us in all to break the trail for the loaded men. Snowshoes were not carried, because there were not enough to go round. Though our prospects of reaching a high point on Everest were already sufficiently dim, I intended to carry out the original plan until obliged by circumstances to modify it; it might prove necessary to spend an extra day in reaching the north col, and in that case we could perhaps afford to stop short of Lhakpa La and establish our camp below its final slopes. But if the strain on this first day was likely to be severe, I argued that the coolies could rest to-morrow, and that the second journey in frozen tracks would be easy enough. That on the col we should pass the night a few hundred feet higher (22,500 feet) was a relatively unimportant consideration. The great matter was to put heart into the coolies; it would be infinitely more encouraging to reach the crest with a sense of complete achievement, to see the clear prospect ahead, and to proceed downwards on the other side. Our start at an early hour on the 20th was sufficiently propitious. The night was exceedingly cold, and we walked on hard crisp snow up to the icefall. But the conditions here were no better than expected; higher they were worse than I had imagined possible. No firm steps could be stamped by the leaders to save the coolies behind, and each in turn had to contend with the shifting substance of fine powder. Three fell out in a state of exhaustion, and made their own way down. Two of the loads were bravely carried on until they had to be abandoned about 800 feet below the pass. The party straggled badly. But time was on our side, and gradually the eleven remaining loads arrived at their destination. The coolies had behaved in the gamest fashion, and no small share in the result was contributed by Morshead, who alternately plodded in front and kept together a party behind. Whatever measure of success we afterwards attained was secured on this day.

Now that we had obtained a clearer view of the north col it was possible to make more exact calculations, and it was evident we must modify our plans. We had seen a wall of formidable dimensions, perhaps 1000 feet high; the surface was unpleasantly broken by insuperable bergschrunds, and the general angle was undoubtedly steep. The slopes of Everest to the south were out of the question, and if it were possible to avoid a direct assault by the north side the way here would be long, difficult, and exceedingly laborious. The wall itself offered the best chance, and I was in good hopes we could get up. But it would not be work for untrained men, and to have on the rope a number of laden coolies, more or less mountain-sick, conducted by so small a nucleus as three sahibs, who would also presumably be feeling the effects of altitude,

was a proposition not to be contemplated for a moment. We must have as strong a party as possible, in the first place simply to reach the col and afterwards to bring up a camp, if we were able, as a separate operation. With this idea I selected the party. Wollaston could not be one of us as his place of duty was not with the van. Only Wheeler besides had sufficient mountaineering experience, and it was decided that he alone should accompany Bullock and myself on our first attempt to reach the col.

I had hoped we should have a full complement of coolies on the 22nd, but when morning came it was found that three, including two of the best men, were too ill to start, consequently some of the loads were rather heavier than I intended. But all arrived safely at Lakpa La before midday. Visited by malicious gusts from the north-west the pass was cheerless and chilly. However, the rim afforded us some protection, and we decided to pitch our tents there rather than descend on the other side with the whole party, a move which I felt might jeopardize the return. I was not very happy about the prospects for the morrow. For my own part I had been excessively and unaccountably tired in coming up to the col; I observed no great sparkle of energy or enthusiasm among my companions. Sanglu was practically *hors de combat*; some of the coolies had, with difficulty, been brought up to the col and were more or less exhausted, and many complaints of headache, even from the best of them, were a bad sign.

There was no question of bustling off before dawn on the 23rd, but we rose early enough, as I supposed, to push on to the north col if we were sufficiently strong. Morshead and I, in a Mummery tent, had slept well. I congratulated myself on an act of mutilation in cutting two large slits in its roof. The rest had not fared so well, but seemed fit enough, and the wonderful prospect from our camp at sunrise was a cheering sight. With the coolies, however, the case was different. Those who had been unwell overnight had not recovered, and it was evident that only a comparatively small number would be able to come on. Eventually I gathered ten—two men, who both protested they were ill, casting lots for the last place; and of these ten it was evident that none were unaffected by the height, and several were more seriously mountain-sick.* Under these circumstances it was necessary to consider which loads should be carried on. Howard-Bury, Wollaston, and Morshead suggested that they should go back at once so as not to burden the party with the extra weight of their belongings, and it seemed the wisest plan that they should return. Certain stores were left behind at Lhakpa La as reserve supplies for the climbing party. I decided at an early hour that our best chance was to take an easy day, and, after a late start and a very slow march, we pitched our tents on the open snow up towards the col.

* I use this expression to denote, not a state of intermittent vomiting, but simply one in which physical exertion exhausts the body abnormally, and causes a remarkable disinclination to further exertion.

It might have been supposed that in so deep a combe and sheltered on three sides by steep mountain slopes we should find a tranquil air and the soothing though chilly calm of undisturbed frost. Night came clearly indeed, with no gentle attentions. Fierce squalls of wind visited our tents and shook and worried them with the disagreeable threat of tearing them away from their moorings, and then scurried off, leaving us in wonder at the change and asking what next to expect. It was a cold wind at an altitude of over 22,000 feet, and however little one may have suffered the atmosphere discouraged sleep. Again, I believe I was more fortunate than my companions, but Bullock and Wheeler fared badly. Lack of sleep, since it makes one sleepy, always discourages an early start, and hot drinks take time to brew. In any case, it was wise not to start too soon so as to have the benefit of warm sun whenever our feet should be obliged to linger in cold snow or ice steps. It was an hour or so after sunrise when we started, and half an hour later we were breaking the crust on the first slopes under the wall. We had taken three coolies who were sufficiently fit and competent, and now proceeded to use them for the hardest work. Apart from one brief spell of cutting, when we passed the corner of a bergschrund, it was a matter of straightforward plugging, firstly slanting up to the right on partially frozen avalanche snow, and then left in one long upward traverse to the summit. Only one passage, shortly below the col, caused either anxiety or trouble. Here the snow was lying at a very steep angle and was deep enough to be disagreeable. About 500 steps of very hard work covered all the worst of the traverse, and we were on the col shortly before 11.30 a.m. By this time two coolies were distinctly tired, though by no means incapable of coming on; the third was comparatively fresh. Wheeler thought he might be good for another 500 feet, but had lost all feeling in his feet. Bullock was obviously tired, but by sheer will power would evidently come on—how far one could not say. For my part, I had had the wonderful good fortune of sleeping tolerably well at both high camps, and now finding my best form; I supposed I might be capable of another 2000 feet, and there would be no time for more. But what lay ahead of us? My eyes had often strayed as we came up to the rounded edge above the col and the final rocks below the north-east arête. If ever one had doubted whether the arête were accessible, it was impossible to doubt any longer. On those easy rock and snow slopes was neither danger nor difficulty. But at the present time there was wind. Even where we stood under the lea of a little ice cliff, it came in fierce gusts at frequent intervals, blowing up the powdery snow in an evil manner sufficient to take one's breath away. On the col beyond it was blowing a gale. And higher was a more fearful sight. The powdery fresh snow on the great face of Everest was being swept along in unbroken spindrift, and the very ridge where our route lay was marked out to receive the full fury of this onslaught. We could see the blown snow deflected upwards for a moment where the wind met the

ridge only to rush violently down in a veritable blizzard on the leeward side. To see, in fact, was enough; the wind had settled the question; it would have been folly to go on. Nevertheless, we struggled a few steps further to put the matter to the test. For a few moments we exposed ourselves on the col to feel the full blast, and then struggled back to shelter.

It remained to take the final decision on the morning of the 25th. We were evidently too weak a party to play a waiting game at this altitude. We must either take our camp to the col or go back. A serious objection to going forward lay in the shortage of coolies' rations. Had the men been fit, it would not have been too much for them to go back to Lhakpa La unladen and reach the north col the same day. I doubted whether any two could be found to do that now; and to subtract two was to leave only eight, of whom two were unfit to go on, so that six would remain to carry seven loads. However, the distance to the col was so short that I was confident such difficulties could be overcome one way or another. A more unpleasant consideration was the thought of requiring a party which already felt the height too much to sleep at least 1000 feet higher. We might well find it more than we could do to get back over Lhakpa La and be forced to make a hungry descent down the Rongbuk Valley. But there would be no disaster in that event. The crucial matter was the condition of the climbers. It seemed we had not sufficient strength to allow a margin for the unforeseen. And what more were we likely to accomplish from a camp on the north col? The second night had been no less windy than the first. Ever since the weather had cleared the wind had been strong from north-west, and every day we had seen the powdery cloud blown from the mountain crests. The only signs of a change now pointed to no improvement, but rather a fall of snow, by no means an improbable event according to local lore. The arguments, in fact, were all on one side; it would be bad heroics to take wrong risks; and fairly facing the situation one could only admit the necessity of retreat.

It may be added that the real weakness of the party became only too apparent in the course of our return journey over Lhakpa La on this final day; and it must be safe to say that none of the three climbers has ever felt a spasm of regret about the decision to go back or a moment's doubt as to its rightness. It was imposed upon us by circumstances without a reasonable alternative.

No considerations can be more important for future guidance than those affecting the health of the party. But here knowledge will not best be sought from one man's report, even the doctor's. If every member of the expedition were to write a full and frank report of his own health from first to last, with particular reference to the effects of elevation, we might begin to know something about it. I know chiefly in a negative way, and in any case not minutely, how I felt in differing circumstances at various

elevations; I know just a little how Bullock was affected, and still less about the coolies. It may possibly be worth adding a few inferences to what has previously been recorded by other parties in the Himalayas.

It is unfortunate for the present purpose that I enjoyed an almost uniform good health at all elevations from first to last. So far as mere living at high altitudes is concerned I observed almost no effects in my own case. My appetite was never-failing. I ate large quantities of solid food, mutton, potatoes, quaker oats, bread, and biscuits—whatever presented itself—and it was often decidedly unattractive; and after a day's climbing I had the same craving for sweet things which I have often noticed in the Alps, where, at a place like Zermatt, the consumption of a great number of sweet cakes seems only to stimulate my energy. And I almost invariably slept well at almost all our camps, more lightly perhaps at the higher ones, but with sufficiently refreshing unconsciousness. Comfortable ground, sufficient warmth, a pillow rightly adjusted, all the conditions of a contented body, mattered far more to me than the quality of the air I breathed. On one occasion, after sleeping less well than usual at 17,000 feet, I went up to 20,000 feet and slept in divine oblivion, waking only to see the dawn with fresh delight. Not every one was quite so fortunate as myself. Bullock's appetite, though it improved later to admiration, was notably deficient during the first three weeks for one who was working his body so hard; and he was short of sleep at our highest camps. But in general he seemed hardly to suffer from the fact of living for a few days together at elevations above 17,000 and 18,000 feet. Some other members of the expedition seemed not to be quite at their best at 20,000 feet, and at Lhakpa La were imperfectly refreshed by the night's rest. As to the coolies, I fear their discomforts were apt to increase at the higher camps more than ours, and consequently they may have suffered some loss of sleep, but I have not the slightest evidence to show that after spending a night or several nights at a high camp, except at the last two, they were in any way less fit to go on next day as a consequence of the altitude.* It should, perhaps, be added that it seemed in some physical way a relief to come down after staying a long time about 17,000 feet or higher; but on the two occasions when we rested for some days at about 12,000 feet (Kharta), it seemed to me that we were less rather than more fit when we went up again.

Another aspect of this inquiry is the effects of altitude over a longer period. What were the general effects upon health after two or three months? When the party gathered at Kharta, towards the end of August, I observed that most of us seemed remarkably fit; but not so Bullock; he was too thin and appeared to require rest. I dare say he took it with advantage. About myself it is worth remarking that I had completely recovered, with the aid of a tonic, from a nasty visitation of fever and

* Nevertheless, I think it a wise precaution to avoid much sleeping at camps as high as 20,000 feet.

sore throat *without coming down to lower altitudes*. The last few days of our reconnaissance were a strenuous time, but for the expedition, which, far more than any other, demanded endurance, when we first reached Lhakpa La, I was perfectly fit. Nevertheless, when we went up again on August 30 I was mountain-sick, and never afterwards in September regained my earlier strength. Nor I think did Bullock. It is difficult to account for this deterioration, unless we suppose that altitude, though it may have no immediate effect, takes its toll at length. Wheeler, whose experiences of high camps may be compared with ours, may not agree with this conclusion as fitting his own case; but then his case was different.

Exertion at great heights is another matter, and less dubious in its results. I suppose them to be sufficiently well known. I observed especially: (1) Rapid acclimatization much as in the Alps, but even more remarkable. (2) Very little relief in coming down; descent was very definitely an exertion, and fatigue continued to increase, especially on gentle slopes; it was necessary to breathe with conscious effort even when descending. (3) The difference between what we could do, say, at 18,000 feet and 20,000 feet was greater in the case of the coolies, whenever they carried loads, than in others. The coolies always appeared to feel the height more quickly. I put this down partly to the fact that few of them really learned either how to breathe or how to husband their strength. Certainly they were much better towards the end, walking rhythmically, but to the last the majority were inclined to hurry. In any case, a small load makes a big difference, but can be compensated largely by reducing pace. (4) Headache was at least as common after descent as before; but personally, so long as I was perfectly fit, and remembered to breathe properly, I did not suffer from headache. (5) A stomach disordered, even in the smallest degree, enormously decreased one's power of endurance. (6) In the last stages, whether as a result of higher altitudes or unfitness I cannot say, a prolonged exertion required more rest—two whole days. This applies to the coolies as well as to myself and others, too, I believe. (7) I was much surprised to find how easily steps might be cut at 21,000 feet. I found myself quite untired after an hour's work in hard ice. (8) We had little experience of rock climbing; but from such as we had (*e.g.* some steep pitches on one of the peaks which we climbed west of the Rongbuk), I am inclined to think that easy rocks, where one is constantly helping oneself up with arms as well as legs, offer the least tiring way of ascent; and that even comparatively difficult rocks might very well be climbed by fit men up to 23,000 feet.

Finally, it may perhaps be worthy of remark that on the very few occasions when my mind was exerted, I found mental exertion to be tiring at high altitudes and tending to sleeplessness. The life of the lotus-eater was best between expeditions—with perhaps a little piquet.

Is it humanly possible to reach the summit of Everest? We have not a single convincing argument to solve that problem. I felt somehow, when we reached the north col, that the task was not impossible; but that may only have been a delusion based on the appearance of the mountain from that point; it looks much smaller than it is. However, one factor, easily forgotten, is in favour of the assault. The higher one goes the less will be the effect of any given rise. To ascend the 3000 feet above 17,000 is notably less laborious than to ascend the next 3000 up to 23,000 feet; but the atmospheric pressure diminishes less rapidly as one goes up; consequently the difference in effort required between one stage and another should be less at each succeeding stage, and least of all between the last stage and the last but one. I believe it to be possible, at all events, for unladen mountaineers to reach 26,000 feet, and if they can go up so far without exhaustion, I fancy the last 3000 feet will not prove so very much more tiring as to exclude the possibility of their reaching the summit.

But in asserting this bare possibility, which, besides, leaves the coolies out of account, I am very far from a sanguine estimate as to the prospects of success. Before we parted, I put this question to Bullock: "What are the chances that a given party will get up in a given year?" After considered reflection, he replied: "Fifty to one against." That answer also expressed my own feelings. Perhaps at a greater distance from the mountain I am now more sanguine. If men could be found to besiege Everest year after year, I believe it would surrender at last. But the chances against any particular expedition are indeed very large. I assume that principles time-honoured in the Alpine Club will be honoured no less on Mount Everest than on other mountains. Climbers, of course, are always taking risks; but there are some which experience and *à priori* reason alike reject. A party of two arriving at the top, each so tired that he is beyond helping the other, might provide good copy for the press, but the performance would provoke the censure of reasonable opinion. If any one falls sick at the last camp, he must be taken down with an adequate escort and as soon as possible; and similarly on the final day. And coolies who become exhausted in carrying up their loads cannot be allowed to make their own way down; exhausted they are incompetent, and must be properly looked after. It is with such difficulties and such necessities that we have to reckon; and any reckoning, I believe, which fairly weighs the conditions and circumstances governing such an enterprise can only come to the conclusion that the chances in favour of success for any particular party are small indeed.

Before Colonel Howard-Bury's paper, Colonel Sir FRANCIS YOUNGHUSBAND, President R.G.S., after thanking His Royal Highness the Duke of York for honouring the Meeting with his presence, and reading telegrams of congratulation from the Alpine Club of Canada and the Société de Géographie of Paris, said: We are here to welcome back Colonel Howard-Bury and the members

of the Mount Everest Expedition, and to congratulate them upon having exactly achieved the object with which they were dispatched, namely, to discover the most practicable way to the summit of the mountain. They were not instructed to attempt to reach the summit, or to break any record. That task was to be reserved for next year's expedition. But they were expected to find out what was without any shadow of doubt the most feasible way to the top, so that next year's expedition might, without any hesitation, go full speed ahead along that route, and that object they have most definitely and unquestionably accomplished. So now we can set about our main effort on the sure foundations which Colonel Howard-Bury and Mr. Mallory have laid, in perfect confidence that we are on the right track.

"Seek ye first the very highest, and all these things shall be added unto you." We sought first the highest mountain in the world, and now we are seeking the very top of that highest mountain. And already a number of most delightful things have been added unto us. First, we have Colonel Howard-Bury's graphic telegrams and the magnificent photographs which he and Mr. Wollaston sent back, revealing to us mountain scenery of a grandeur not to be surpassed, and the enjoyment of which can now be shared by men in every country and for all time—enjoyment which will be greatly increased when we have the paintings of the artist whom we shall be sending with the expedition next year. Then came Mr. Wollaston's natural history collections, telling us of the height to which life ascends on these highest mountains, and including seeds—already planted at Kew and Edinburgh, and in the Royal Horticultural Society Gardens—of new or rare primulas, gentians, and rhododendrons and other plants which will add to the beauty of our gardens. After this came a map by Major Morshead, of the whole region; and another by Major Wheeler, of the mountain itself and its immediate neighbourhood, is expected daily. An account of the geology of the region by Dr. Heron is on its way. Lastly has come the bill. We had expected it to be £5000. Actually it is only £4000—that is, excluding the expenses incurred by the Government of India on the survey.

These results were rendered possible in the first instance by the generosity of our Patron, His Majesty the King, and our Vice-Patron, H.R.H. the Prince of Wales, and other liberal donors to the funds of the expedition, especially the members of the Alpine Club, who, urged on by the persuasiveness of their President and the coerciveness of Captain Farrar, contributed more than £3000. But the chief credit for the satisfactory result is, of course, due to those who worked so arduously on the spot—to Colonel Howard-Bury, who with such skill and address conducted the expedition as a whole, overcame all initial difficulties, and brought the climbers up to the mountain; to Messrs. Mallory and Bullock for their resolute persistence in ferreting out a way, when they were deprived of the guidance of that experienced Himalaya climber, Dr. Kellas, whose death we so deeply deplore, and of their mountain leader Mr. Raeburn; to Mr. Wollaston for the thoroughness with which he carried out his scientific duties and looked after the health of the party; to Major Morshead and Major Wheeler for their untiring energy in mapping so lofty a mountain region, and for the rapidity with which they have furnished us with maps; and lastly to Dr. Heron, whose energy seems to have been remarkable even among such energetic men.

With this necessarily brief but most sincere acknowledgment of their services, I now invite the chief of the expedition to give us an account of his charge.

Colonel Howard-Bury then read the paper printed above.

Before Mr. Mallory's paper, Prof. J. NORMAN COLLIE, President of the Alpine Club, said: From a mountaineering point of view the Expedition to Mount Everest has been most successful; an easy route has been discovered, free from any prolonged difficult climbing, by which it is hoped that next year the ascent of Mount Everest may be made. The ascent, however, could only be attempted in the very finest weather, and we are yet ignorant whether much climbing can be done as high as 28,000 to 29,000 feet. The Expedition was sent out this year primarily to make a complete reconnaissance of Mount Everest. This has been done thoroughly. On every side, except on the south, which is in Nepal, all the valleys leading to the great peak have been explored. The climbers, Messrs. Mallory and Bullock, with untiring energy, have been more than once to over 23,000 feet, visited many passes, and explored a large number of glaciers. A magnificent series of mountain photographs have been secured. Taking into consideration the difficulties of climbing at such altitudes, the mountaineers are to be congratulated warmly on their success.

Mr. Mallory then read the paper printed above.

The President expressed his great regret that the lateness of the hour made it impossible to call on Mr. A. F. R. Wollaston, the Surgeon and Naturalist of the expedition, for his account of the very interesting work on the flora and fauna of the region. All present would be anxious to hear him on another occasion.

Monsieur A. GATINE (Vice-Président du C.A.F.): Mes premières paroles seront pour vous dire avec quelle gratitude le Comité de Direction du Club Alpin Français a reçu la cordiale invitation qui lui a été adressée pour cette réception magnifique des courageux explorateurs de l'Himalaya. Nous vous prions d'agréer les excuses et les regrets de notre Président, M. le Baron Gabet, que des nécessités impérieuses ont empêché d'être ici ce soir, comme c'était sa formelle intention. Nous sommes heureux, M. Henry Bregeault, Secrétaire-Général, M. Richard-Berenger, Membre du Comité de Direction, et moi, d'avoir en cette mémorable circonstance la bonne fortune d'être les porte-paroles du Club Alpin Français auprès des Membres de l'Alpine Club et de la Royal Geographical Society. Nous saluons dans ces deux Sociétés deux des Associations les plus anciennes et les plus actives du Monde, justement renommées pour leurs travaux et leurs publications. Elles ont su ne pas se reposer sur leurs lauriers, comme nous disons en France, et voici que, une fois de plus, nous les trouvons à la tête du mouvement et du progrès, à l'occasion de l'étude et de l'exploration du massif montagneux le plus haut du Globe. Nous ne saurions oublier que les Membres de l'Alpine Club ont toujours été parmi les plus actifs et les plus hardis des Alpinistes qui se sont attaqués aux cimes vierges de la Savoie et du Dauphiné. Les noms de beaucoup d'entre eux brillent au premier rang dans ce qu'on a appelé "la période héroique de l'Alpinisme."

Cette période sera-t-elle couronnée, en quelque sorte, dès l'année prochaine par la conquête de la plus haute cîme du Monde? Nous le souhaitons de tout cœur. Nous désirons en tout cas apporter dès à présent les félicitations du Club Alpin Français aux organisateurs que la confiance des deux puissantes associations a chargés de la préparation méthodique d'une expédition aussi hardie que l'assaut du Mont-Everest, et nous exprimons notre admiration aux Savants, aux Alpinistes, aux Topographes dont les travaux et l'endurance ont déjà obtenu ce superbe résultat de découvrir, dès cette première campagne,

au cours d'une ascension bravement pousée jusqu'à plus de 2000 métres au-dessus de l'altitude du Mont-Blanc, une voie d'accès, qui paraît praticable, vers le sommet du Géant des Montagnes. Nous déplorons que de pareilles expéditions ne puissent se faire sans de très grandes risques, et nous souhaitons aux explorateurs de 1922 de revenir tous en parfaite santé, après que les Alpinistes de l'expédition auront eu l'honneur d'atteindre le plus haut sommet qui dans le Monde reçoive le baiser du soleil.

Mes collègues et moi, nous vous félicitous infiniment de la fraternité cordiale des Alpinistes Britanniques et Français, semblable à celle des combattants de nos deux Nations, qui ont souffert et lutté côte à côte pendant la Grande Guerre, et dans un sentiment de gratitude pour l'amiable accueil fait aux représentants du Club Alpin Français, nous souhaitons tous les bonheurs, tous les succès à votre Altesse Royale, à Monsieur le Président de l'Alpine Club, à Monsieur le Président de la Royal Geographical Society.

The President, in conclusion, offered the congratulations and thanks of the Meeting to the speakers, Colonel Howard-Bury and Mr. Mallory, and to all the members of the expedition; and in the name of the R.G.S. and the Alpine Club thanked the French Alpine Club for their signal proof of friendship in sending a distinguished delegation from France to attend the Meeting.

A CHINESE EXPEDITION ACROSS THE PAMIRS AND HINDUKUSH, A.D. 747

Sir Aurel Stein, K.C.I.E.

AT the beginning of my second Central Asian journey (1906–08), and again at that of the third (1913–16), I had the good fortune to visit ground in the high snowy range of the Hindukush which, however inaccessible and remote it may seem from the scenes of the great historical dramas of Asia, was yet in the eighth century A.D. destined to witness events closely bound up with a struggle of momentous bearing for vast areas of the continent. I mean the glacier pass of the Darkot (15,400 feet above sea-level) and the high valleys to the north and south of it through which leads an ancient route connecting the Pamirs and the uppermost headwaters of the Oxus with the Dard territories on the Indus, and thus with the north-west marches of India.*

The events referred to arose from the prolonged conflict with the Arabs in the west and the rising power of the Tibetans in the south

* The accompanying sketch-map 1 is intended to illustrate the general features of the mountain territories between the western T'ien-shan and the Indus which were affected by the political developments and military operations discussed in this paper.

Sketch-map 2 reproduces essential topographical details of that portion of the ground between the uppermost Oxus and Gilgit river valleys which witnessed the chief exploits of the Chinese expedition of A.D. 747 into the Hindukush region. It has been prepared from Northern Transfrontier Sheet No. 2 S.W. of the Survey of India, scale 4 miles to 1 inch.

For convenient reference regarding the general topography of this mountain region may be recommended also sheet No. 42 of the 1 : 1,000,000 map of Asia published by the Survey of India (Calcutta, 1919).

1. SKETCH-MAP OF MOUNTAIN COUNTRY BETWEEN THE WESTERN T'IEN-SHAN AND THE INDUS

Scale 1/700,000 or 1 Inch = 11 Miles
5 0 5 10 15
Routes assumed to have been used by the Chinese expeditionary force. A.D. 747.
Indicates approximately the extent of permanent snow.
Victoria Lake
Karachung Kul
Burgutai P.
Boza Gumbaz
Karvan balasi
Langar
Baikrh
Kholdurchat
Nishikhar
Chilkikand
Karkat
Pixkhar
Barogh
Baroghil P.
Shawitakh P.
Karambar P.
Khora Bhort P.
Irshad Pass
Chillinji P.
Rukang
Yarkhun R.
Darkot P.
Garmush
Darkot
Ashkuman R.
Kaloch
Galtar
Dasper
Hundur
Khuin
Mir Wali
Barandas
Asambar R.
Ghujalu
YASIN
Gindai
Idgah
Hupar
Darkand
Gupis F.
Roshan
Dakimal
Gakuh R.
Bichgar
Chatorkand
Ashkuman
Dalin
Bulhanz
Karambar
Bohrt
Sokhta Kohat
Makuram Das
Shoshi
Tui
Nasbar Gol.
Dasht-i-Tausi
Jamarot
Darkot Glacier
Shimshal Glacier
Shimshal Pass
Yarkhun Glacier
Victoria Glacier
Wakhan R.
Yasin R.
Gupis R.
Ishkuman R.
Karambar R.
Gilgit R.
To Gilgit
To Mastuj
To Chitral
To Langar
To Yarkand
To Kashgar
To Pamir
To Tashkurgan
To Kilik
To Mintaka
To Baltit
To Gilgit
Hunza
Nagar
Yasin
Ishkuman
Punial
Gilgit
Ghizr
Gupis
Yasin
Darkot
Mastuj
Yarkhun
Chitral
Wakhan
Sarikol
Kunjut Kul
Shuiveng
Gazan P.
Surkiveng
Darband
Dasper
Shoshi
Tui
Khuin
Mir Wali
Barandas
Asambar R.
Ghujalu
Nasbar Gol.
Dasht-i-Tausi
Jamarot
Darkand
Gupis F.
Roshan
Dakimal
Gakuh R.
Bichgar
Chatorkand
Ashkuman
Dalin
Bulhanz
Karambar
Bohrt
Sokhta Kohat
Makuram Das
Hupar
Idgah
Gindai
Yasin
Ishkuman
Karambar R.
Ishkuman R.
Gilgit R.
Gupis R.
Yasin R.
Wakhan R.
Darkot Glacier
Shimshal Glacier
Shimshal Pass
Yarkhun Glacier
Victoria Glacier

into which the Chinese empire under the T'ang dynasty was brought by its policy of Central Asian expansion. Our knowledge of the memorable expedition of which I propose to treat here, and of the historical developments leading up to it, is derived wholly from the official Chinese records contained in the Annals of the T'ang dynasty. They were first rendered generally accessible by the extracts which M. Chavannes, the lamented great Sinologue, published in his invaluable 'Documents sur les Turcs occidentaux.' *

In order to understand fully the details of the remarkable exploit which brought a Chinese army right across the high inhospitable plateaus of the Pamirs to the uppermost Oxus valley, and thence across the ice-covered Darkot down to the valleys of Yasin and Gilgit draining into the Indus, it is necessary to pay the closest regard to the topography of that difficult ground. Modern developments arising from the Central Asian interests of two great Asiatic powers, the British and Russian empires, have since the eighties of the last century helped greatly to add to our knowledge of the regions comprised in, or adjacent to, the great mountain massif in the centre of Asia which classical geography designated by the vague but convenient name of *Imaos*. But much of the detailed topographical information is not as yet generally accessible to students. Even more than elsewhere personal familiarity with the ground in its topographical and antiquarian aspects seems here needed for a full comprehension of historical details.

This local knowledge I was privileged to acquire in the course of the two Central Asian expeditions already referred to, and accordingly I have taken occasion to elucidate the facts connected with that memorable Chinese exploit in *Serindia*, the detailed report on my second journey, soon to be issued from the Oxford University Press.† The bulk and largely archæological contents of this work may prevent that account from attracting the attention of the geographical student. Hence, with the kind permission of the Delegates of the Oxford University Press, I avail myself of the opportunity to present here the main results of my researches.

Some preliminary remarks seem needed to make clear the political and military situation which prevailed in Central Asia during the first half of the eighth century A.D., and which accounted for the enterprise to be discussed here. ‡ After a long and difficult struggle the Chinese under the great T'ang emperors T'ai-tsung (A.D. 627–650) and Kao-tsung (A.D. 650–684) succeeded in vanquishing, first the Northern Turks (A.D. 630), and after a short interval also the Western Turks. They were the

* 'Documents sur les Tou-kiue (Turcs) occidentaux recueillis et commentés par Édouard Chavannes, Membre de l'Institut,' etc., published by the Imperial Academy of Sciences of St. Petersburg, 1903; see in particular pp. 149–154.

† The work has appeared since the above was written [ED. *G. J.*]

‡ For a masterly exposition from Chinese and Western sources of all historical facts here briefly summed up, see M. Chavannes' 'Essai sur l'histoire des Tou-kiue occidentaux,' forming the concluding portion of his 'Documents sur les Turcs occidentaux,' pp. 217–303.

principal branches of that great Turkish nation which since its victory over the Juan-juan (Avars) and the Hoa, or Hephthalites, about the middle of the seventh century, had made itself master of inner Asia. By A.D. 659 the Chinese had regained political predominance, and for the most part also military control, over the great Central Asian territories roughly corresponding to what is now known as Chinese Turkestan, after having lost them for about four centuries.*

This renewed effort at Central Asian expansion, like that first made by the great Han emperor Wu-ti (140–86 B.C.), had for its object partly the protection of north-western China from nomadic inroads and partly the control of the great Central Asian trade route passing through the Tarim basin. Stretching from east to west between the great mountain ranges of the T'ien-shan in the north and the K'un-lun in the south, the Tarim basin is filled for the most part by huge drift-sand deserts. Yet it was destined by nature to serve as the main overland line for the trade intercourse between the Far East and Western Asia, and recent archæological explorations have abundantly proved its great importance generally for the interchange of civilizations between China, India, Iran, and the classical West.

During Han times, when China's great export trade of silk had first begun about 110 B.C. to find its way westwards through the strings of oases scattered along the foot of the T'ien-shan and K'un-lun, the Chinese hold upon the "Western Kingdoms" with their settled and highly civilized populations had been threatened mainly by inroads of the Huns and other nomadic tribes from the north. After the reconquest under the Emperor Kao-tsung the situation was essentially different. The danger from the nomadic north had lessened. Troubles with the medley of Turkish tribes left in possession of the wide grazing areas beyond the T'ien-shan never ceased. Yet the Chinese administration by a well-organized system of garrisons, and still more by diplomatic skill, was well able to hold them in check. But additional and greater dangers had soon to be faced from other sides. The claim to the succession of the whole vast dominion of the Western Turks was drawing the administration of the Chinese protectorate, established in the Tarim basin and known as the "Four Garrisons," into constant attempts to assert effective authority also to the west of the great meridional range, the ancient *Imaos*, in the regions comprising what is now Russian and Afghan Turkestan.†

Considering the vast distances separating these regions from China proper and the formidable difficulties offered by the intervening great deserts and mountain ranges, Chinese control over them was from the outset bound to be far more precarious than that over the Tarim basin.

* Cf. Chavannes, 'Turcs occidentaux,' pp. 266 *sqq*.

† For very interesting notices of the administrative organization which the Chinese attempted soon after A.D. 659 to impose upon the territories from the Yaxartes to the Oxus and even south of the Hindukush, see Chavannes, 'Turcs occidentaux,' pp. 268 *sqq*.

But the dangers besetting Chinese dominion in Central Asia increased greatly with the appearance of two new forces upon the scene. Already in the last quarter of the seventh century the newly rising power of the Tibetans seriously threatened and for a time effaced the Chinese hold upon the Tarim basin.* Even after its recovery by the Chinese in A.D. 692 the struggle never quite ceased.

Another and almost equally great threat to China's Central Asian dominion arose in the west through the advance of Arab conquest to the Oxus and beyond. About A.D. 670 it had already made itself felt in Tokharistan, the important territory on the middle Oxus comprising the greater part of the present Afghan Turkestan. Between A.D. 705 and 715 the campaigns of the famous Arab general Qotaïba had carried the Muhammadan arms triumphantly into Sogdiana, between Oxus and Yaxartes, and even further.† By taking advantage of internal troubles among the Arabs and by giving support to all the principalities between the Yaxartes and the Hindukush which the Arabs threatened with extinction, the Chinese managed for a time to stem this wave of Muhammadan aggression. But the danger continued from this side, and the Chinese position in Central Asia became even more seriously jeopardized when the Tibetans soon after A.D. 741 advanced to the Oxus valley and succeeded in joining hands with the Arabs, their natural allies.

Baulked for the time in their attempts to secure the Tarim basin, the Tibetans had only one line open to effect this junction. It led first down the Indus from Ladak through Baltistan (the "Great P'o-lü" of the Chinese Annals) to the Hindukush territories of Gilgit and Yasin, both comprised in the "Little P'o-lü" of the Chinese records.‡ Thence the passes of the Darkot and the Baroghil—the latter a saddle in the range separating the Oxus from the Chitral river headwaters—would give the Tibetans access to Wakhan; through this open portion of the upper Oxus valley and through fertile Badakhshan the Arabs established on the middle Oxus might be reached with comparative ease. But an advance along the previous portions of this route was beset with very serious difficulties, not merely on account of the great height of the passes to be traversed and of the extremely confined nature of the gorges met with on the Indus and the Gilgit river, but quite as much through the practical absence of local resources sufficient to feed an invading force anywhere between Ladak and Badakhshan.

Nevertheless the persistent advance of the Tibetans along this most difficult line is clearly traceable in the Chinese records. "Great P'o-lü," *i.e.* Baltistan, had already become subject to them before A.D. 722. About that time they attacked "Little P'o-lü," declaring, as the T'ang Annals

* Cf. Chavannes, 'Turcs occidentaux,' pp. 280 *sqq.*

† See Chavannes, *ibid.*, pp. 288 *sqq.*

‡ Cf. for this identification Chavannes, *ibid.*, p. 150, and 'Notes supplémentaires'; also my 'Ancient Khotan,' i. pp. 6 *sqq.*

tell us, to Mo-chin-mang its king: "It is not your kingdom which we covet, but we wish to use your route in order to attack the Four Garrisons (*i.e.* the Chinese in the Tarim basin)." * In A.D. 722 timely military aid rendered by the Chinese enabled this king to defeat the Tibetan design. But after three changes of reign the Tibetans won over his successor Su-shih-li-chih, and inducing him to marry a Tibetan princess secured a footing in "Little P'o-lü." "Thereupon," in the words of the *T'ang shu*, "more than twenty kingdoms to the north-west became all subject to the Tibetans." † These events occurred shortly after A.D. 741.‡

The danger thus created by the junction between Tibetans and Arabs forced the Chinese to special efforts to recover their hold upon Yasin and Gilgit. Three successive expeditions despatched by the "Protector of the Four Garrisons," the Chinese Governor-General, had failed, when a special decree of the Emperor Hsüan-tsang in A.D. 747 entrusted the Deputy Protector Kao Hsien-chih, a general of Korean extraction commanding the military forces in the Tarim basin, with the enterprise to be traced here. We owe our detailed knowledge of it to the official biography of Kao Hsien-chih preserved in the T'ang Annals and translated by M. Chavannes. To that truly great scholar, through whose premature death in 1918 all branches of historical research concerning the Far East and Central Asia have suffered an irreparable loss, belongs full credit for having recognized that Kao Hsien-chih's remarkable expedition led him and his force across the Pamirs and over the Baroghil and Darkot passes. But he did not attempt to trace in detail the actual routes followed by Kao Hsien-chih on this hazardous enterprise or to localize the scenes of all its striking events. To do this in the light of personal acquaintance with the topography of these regions, their physical conditions, and their scanty ancient remains, is my object in the following pages.

With a force of 10,000 cavalry and infantry Kao Hsien-chih started in the spring of A.D. 747 from *An-hsi*, then the headquarters of the Chinese administration in the Tarim basin and corresponding to the present town and oasis of Kucha.§ In thirty-five days he reached *Su-lê*, or Kashgar, through Ak-su and by the great caravan road leading along the foot of the T'ien-shan. Twenty days more brought his force to the military post of the Ts'ung-ling mountains, established in the position of the present Tash-kurghan in Sarikol.‖ Thence by a march of twenty days the "valley of

* See Chavannes, 'Turcs occidentaux,' p. 150.

† Cf. Chavannes, *ibid.*, p. 151. By the twenty kingdoms are obviously meant petty nill principalities on the Upper Oxus from Wakhan downwards, and probably also others in the valleys south of Hindukush, such as Mastuj and Chitral.

‡ Cf. Stein, 'Ancient Khotan,' i. p. 7. A.D. 741 is the date borne by the Imperial edict investing Su-shih-li-chih's immediate predecessor; its text is still extant in the records extracted by M. Chavannes, 'Turcs occidentaux,' pp. 211 *sqq.*

§ For these and all other details taken from M. Chavannes' translation of Kao Hsien-chih's biography in the *T'ang shu*, see 'Turcs occidentaux,' pp. 152 *sqq.*

‖ *Ts'ung-ling*, or "the Onion Mountains," is the ancient Chinese designation for the great snowy range which connects the T'ien-shan in the north with the K'un-lun and

Po-mi," or the Pamirs, was gained, and after another twenty days Kao Hsien-chih arrived in "the kingdom of the five Shih-ni," *i.e.* the present Shighnan on the Oxus.

The marching distance here indicated agrees well with the time which large caravans of men and transport animals would at present need to cover the same ground. But how the Chinese general managed to feed so large a force after once it had entered the tortuous gorges and barren high valleys beyond the outlying oases of the present Kashgar and Yangi-hissar districts is a problem which might look formidable, indeed, to any modern commander. The biography in the Annals particularly notes that "at that time the foot soldiers all kept horses (*i.e.* ponies) on their own account." Such a provision of transport must have considerably increased the mobility of the Chinese troops. But it also implied greatly increased difficulties on the passage through ranges which, with the exception of certain portions of the Pamirs, do not afford sufficient grazing to keep animals alive without liberal provision of fodder.

It was probably as a strategic measure meant to reduce the difficulties of supply in this inhospitable Pamir region that Kao Hsien-chih divided his forces into three columns before starting his attack upon the position held by the Tibetans at *Lien-yün*. M. Chavannes has shown good reason for assuming that by the river *P'o-lê* (or *So-lê*), which is described as flowing in front of Lien-yün, is meant the Ab-i-Panja branch of the Oxus, and that Lien-yün itself occupied a position corresponding to the present village of Sarhad, but on the opposite, or southern, side of the river, where the route from the Baroghil pass debouches on the Ab-i-Panja. We shall return to this identification in detail hereafter. Here it will suffice to show that this location is also clearly indicated by the details recorded of the concentration of Kao Hsien-chih's forces upon Lien-yün.

Of the three columns which were to operate from different directions and to effect a simultaneous junction before Lien-yün on the thirteenth day of the seventh month (about the middle of August), the main force, under Kao Hsien-chih himself and the Imperial Commissioner Pien Ling-ch'êng, passed through the kingdom of Hu-mi, or Wakhan, ascending the main Oxus valley from the west. Another column which is said to have

Hindukush in the south, and forms the mighty eastern rim of the Pamirs. The Chinese term is sometimes extended to the high valleys and plateaus of the latter also. The range culminates near its centre in the great ice-clad peak of Muztagh-ata and those to the north of it, rising to over 25,000 feet above sea-level. It is to this great mountain chain, through which all routes from the Oxus to the Tarim basin pass, that the term *Imaos* is clearly applied in Ptolemy's 'Geography.'

The great valley of Sarikol, situated over 10,000 feet above sea-level, yet largely cultivated in ancient times, forms the natural base for any military operations across the Pamirs; for early accounts of it in Chinese historical texts and in the records of old travellers from the East and West, cf. my 'Ancient Khotan,' i. pp. 27 *sqq*. Descriptions of the present Sarikol and of the two main routes which connect it with Kashgar, through the Gez valley to the north of Muztagh-ata and across the Chichiklik pass in the south, are given in my 'Ruins of Khotan,' pp. 67 *sqq*., and 'Desert Cathay,' i. pp. 89 *sqq*.

moved upon Lien-yün by the route of *Ch'ih-fo-t'ang*, "the shrine of the red Buddha," * may be assumed, in view of a subsequent mention of this route below, to have operated from the opposite direction down the headwaters of the Ab-i-Panja. These could be reached without serious difficulty from the Sarikol base either over the Tagh-dumbash Pamir and the Wakhjir pass (16,200 feet),† or by way of the Naiza-tash pass and the Little Pamir. Finally, a third column, composed of 3000 horsemen, which was to make its way to Lien-yün by *Pei-ku*, or "the northern gorge," may be supposed to have descended from the side of the Great Pamir. For such a move from the north either one of the several passes could be used which lead across the Nicholas range, south-east of Victoria lake, or possibly a glacier track, as yet unexplored, leading from the latter into one of the gorges which debouch east of Sarhad.‡ In any case it is clear that by thus bringing up his forces on convergent but wholly distinct lines, and by securing for himself a fresh base in distant Shighnan, the Chinese general effectively guarded against those difficulties of supplies and transport which, then as now, would make the united move of so large a body of men across the Pamirs a physical impossibility.

The crossing of the Pamirs by a force which in its total strength amounted to ten thousand men is so remarkable a military achievement that the measures which alone probably made it possible deserve some closer examination, however succinct the Chinese record is upon which we have to base it. So much appears to me clear, that the march was not effected in one body, but in three columns moving up from Kashgar in successive stages by routes of which Tash-kurghan, "the post of the Ts'ung-ling mountains," was the advanced base or *point d'appui*. If Kao Hsien-chih moved ahead with the first column or detachment to Shighnan and was followed at intervals by the other two detachments, the advantage gained as regards supplies and transport must have been very great. His own column would have reached a fresh base of supplies in Shighnan while the second was moving across the main Pamirs and the third arriving in Sarikol from the plains. Thus the great strain of having to feed simultaneously the whole force on ground absolutely without local resources was avoided. It must be remembered that, once established on the Oxus, the Chinese Commissariat could easily draw upon the abundant produce of Badakhshan, and that for the column left on the Pamirs the comparatively easy route across the Alai would be available for drawing supplies from the rich plains of Farghana, then still under Chinese control.

* The term *fo-t'ang*, which M. Chavannes translates "la salle du Bouddha . . .," designates, according to Dr. Giles's Chinese-English Dictionary, p. 1330, "a family shrine or oratory for the worship of Buddha." Considering the location, the rendering of *t'ang* by "shrine" seems here appropriate.

† For descriptions of this route, cf. my 'Ruins of Khotan,' pp. 60 *sqq.*, and 'Desert Cathay,' i. pp. 83 *sqq.*

‡ Regarding the existence of this track, cf. the information obtained in the course of my third Central Asian journey, *Geographical Journal*, 48 (1916), p. 216.

By disposing his force *en échelon* from Shighnan to Sarikol, Kao Hsien-chih obtained also a strategically advantageous position. He was thus able to concert the simultaneous convergent movement of his columns upon the Tibetans at Sarhad without unduly exposing any of his detachments to separate attack and defeat by a superior Tibetan force; for the Tibetans could not leave their position at Sarhad without imminent risk of being cut off from the Baroghil, their only line of communication. At the same time the disposition of the Chinese forces effectively precluded any Tibetan advance either upon Sarikol or Badakhshan. Difficult as Kao Hsien-chih's operations must have been across the Pamirs, yet he had the great advantage of commanding two, if not three, independent lines of supplies (from Kashgar–Yarkand; Badakhshan; eventually Farghana), whereas the Tibetan force of about equal strength, cooped up at the debouchure of the Baroghil, had only a single line, and one of exceptional natural difficulty, to fall back upon. Of the territories of Yasin, Gilgit, Baltistan, through which this line led, we know that they could not provide any surplus supplies for an army.*

The problem, as it seems to me, is not so much how the Chinese general succeeded in overcoming the difficulties of his operations across the Pamirs, but how the Tibetans ever managed to bring a force of nine or ten thousand men across the Darkot to Sarhad and to maintain it there in the almost total absence of local resources. It is certainly significant that neither before nor after these events do we hear of any other attempt of the Tibetans to attack the Chinese power in the Tarim basin by way of the uppermost Oxus, constant, and in the end successful, as their aggression was during the eighth century A.D.

The boldness of the plan which made Kao Hsien-chih's offensive possible and crowned it with deserved success must, I think, command admiration quite as much as the actual crossing of the Darkot. The student of military history has, indeed, reason to regret that the Chinese record does not furnish us with any details about the organization which rendered this first and, as far as we know, last crossing of the Pamirs by a large regular force possible. But whatever our opinion may be about the fighting qualities of the Chinese soldier as judged by our standards—and there is significant evidence of their probably not having been much more serious in T'ang times than they are now—it is certain that those who know the formidable obstacles of deserts and mountains which Chinese troops have successfully faced and overcome during modern times will not feel altogether surprised at the power of resource and painstaking organization which the success of Kao Hsien-chih's operations indisputably attests in that long-forgotten Chinese leader and those who shared his efforts.

The location of *Lien-yün* near Sarhad, as originally proposed by M. Chavannes, is confirmed by the description of the battle by which the

* Cf. 'Ancient Khotan,' i. pp. 11 *sqq.*

Chinese general rendered himself master of the Tibetan position and of the route it was intended to guard. The three Chinese columns operating, as I have shown, from the west, east, and north, "had agreed to effect their junction on the thirteenth day of the seventh month (August) between seven and nine o'clock in the morning at the Tibetan stronghold of Lien-yün. In that stronghold there were a thousand soldiers; moreover, at a distance of 15 *li* (about 3 miles) to the south of the rampart, advantage had been taken of the mountains to erect palisades, behind which there were eight to nine thousand troops. At the foot of the rampart there flowed the river of the valley of *P'o-lê*, which was in flood and could not be crossed.* Kao Hsien-chih made an offering of three victims to the river; he directed his captains to select their best soldiers and their best horses; each man carried rations of dry food for three days. In the morning they assembled by the river-bank. As the waters were difficult to cross, officers and soldiers all thought the enterprise senseless. But when the other river-bank was reached, neither had the men wetted their standards nor the horses their saddle-cloths.

"After the troops had crossed and formed their ranks, Kao Hsien-chih, overjoyed, said to Pien Ling-ch'êng (the Imperial Commissioner): 'For a moment, while we were in the midst of the passage, our force was beaten if the enemy had come. Now that we have crossed and formed ranks, it is proof that Heaven delivers our enemies into our hands.' He at once ascended the mountain and engaged in a battle which lasted from the *ch'ên* period (7–9 a.m.) to the *ssŭ* period (9–11 a.m.). He inflicted a great defeat upon the barbarians, who fled when the night came. He pursued them, killed 5000 men, and made 1000 prisoners; all the rest dispersed. He took more than 1000 horses, and warlike stores and arms beyond counting."

The analysis given above of the routes followed by the Chinese columns, and what we shall show below of Kao Hsien-chih's three days' march to Mount *T'an-chü*, or the Darkot, confirm M. Chavannes in locating the Tibetan stronghold of Lien-yün near the present Sarhad, the last permanent settlement on the uppermost Oxus. It is equally clear from the description of the river crossing that the Chinese concentration must have taken place on the right or northern bank of the Ab-i-Panja, where the hamlets constituting the present Sarhad are situated, while the stronghold of Lien-yün lay on the opposite left bank.

Before I was able to visit the ground in May 1906, I had already expressed the belief that the position taken up by the Tibetan main force, 15 *li* (*circ.* 3 miles) to the south of Lien-yün, must be looked for in the valley which debouches on the Ab-i-Panja opposite to Sarhad.† It is

* M. Chavannes has shown ('Turcs occidentaux,' p. 154) that this name *P'o-lê* is a misreading easily explained in Chinese writing for *So-lê* mentioned elsewhere as a town in Hu-mi or Wakhan.

† See 'Ancient Khotan,' i. p. 7.

through this open valley that the remarkable depression in the main Hindukush range, represented by the Baroghil and Shawitakh saddles (12,460 and 12,560 feet respectively), is gained. I also surmised that the Chinese general, apart from the confidence aroused by the successful river crossing, owed his victory mainly to a flanking movement by which his troops gained the heights, and thus successfully turned the fortified line behind which the Tibetans were awaiting them.

The opinion was confirmed by what I saw of the valley leading to the Oxus on my descent from the Baroghil on 19 May 1906, and by the examination I was able to make two days later of the mountain-side flanking its debouchure from the west. The valley into which the route leads down from the Baroghil is quite open and easy about Zartighar, the southernmost hamlet. There a ruined watch-tower shows that defence of the route had been a concern also in modern times. Further down the valley-bottom gradually contracts, though still offering easy going, until, from a point about 2 miles below Zartighar to beyond the scattered homesteads of Pitkhar,* its width is reduced to between one-half and one-third of a mile. On both sides this defile is flanked by high and very precipitous rocky ridges, the last offshoots of spurs which descend from the main Hindukush watershed.

These natural defences seemed to provide just the kind of position which would recommend itself to the Tibetans wishing to bar approach to the Baroghil, and thus to safeguard their sole line of communication with the Indus valley. The width of the defile would account for the comparatively large number of defenders recorded by the Chinese Annals for the enemy's main line; the softness of the ground at its bottom, which is almost perfectly level, covered with fine grass in the summer, and distinctly swampy in the spring owing to imperfect drainage, would explain the use of palisades, at first sight a rather strange method of fortification in these barren mountains.† Finally, the position seemed to agree curiously well with what two historical instances of modern times, the fights in 1904 at Guru and on the Karo-la, had revealed as the typical and time-honoured Tibetan scheme of defence—to await attack behind a wall erected across the open ground of a valley or saddle.

* The *Pixkhar* of sketch-map 2 is a misprint.

† In my note in 'Ancient Khotan,' p. 9, I had ventured to suggest that, considering how scanty timber must at all times have been about Sarhad, there was some probability that walls or "Sangars" constructed of loose stones were really meant by the "palisades" mentioned in the translation of the passage from the T'ang Annals.

This suggestion illustrates afresh the risk run in doubting the accuracy of Chinese records on quasi-topographical points without adequate local knowledge. On the one hand, I found that the peculiar nature of the soil in the defile would make the construction of heavy stone walls inadvisable, if not distinctly difficult. On the other, my subsequent march up the Ab-i-Panja showed that, though timber was as scarce about Sarhad itself as I had been led to assume, yet there was abundance of willow and other jungle in parts of the narrow river gorge one march higher up near the debouchure of the Shaor and Baharak streams. This could well have been used for palisades after being floated down by the river.

There remained the question whether the defile of Pitkhar was capable of being turned by an attack on the flanking heights such as the Chinese record seemed plainly to indicate. The possibility of such a movement on the east was clearly precluded by the extremely precipitous character of the flanking spur, and still more by the fact that the summer flood of the Ab-i-Panja in the very confined gorge above Sarhad would have rendered that spur inaccessible to the Chinese operating from the northern bank of the river. All the greater was my satisfaction when I heard from my Wakhi informants of ruins of an ancient fort, known as *Kansir*, situated on the precipitous crest of the flanking spur westwards, almost opposite to Pitkhar. During the single day's halt, which to my regret was all that circumstances would allow me at Sarhad, I was kept too busy otherwise to make a close inspection of the ground where the Tibetan post of Lien-yün might possibly have been situated. Nothing was known locally of old remains on the open alluvial plain which adjoins the river at the mouth of the valley coming from the Baroghil; nor were such likely to survive long on ground liable to inundation from the Oxus, flowing here in numerous shifting channels with a total width of over a mile.

Even if the exact position of Lien-yün thus remained undetermined, my short stay at Sarhad sufficed to convince me how closely local conditions agreed with the details of Kao Hsien-chih's exploit in crossing the Oxus. The river at the time of the summer flood must, indeed, present a very imposing appearance as it spreads out its waters over the wide valley-bottom at Sarhad. But the very separation of the waters makes fording always possible even at that season, provided the passage takes place in the early morning, when the flood due to the melting snow and ice is temporarily reduced by the effect of the night's frost on the glaciers and snow-beds at the head of the Ab-i-Panja. The account in the Annals distinctly shows that the river passage must have been carried out at an early hour of the morning, and thus explains the complete success of an otherwise difficult operation.

I was able to trace the scene of the remaining portion of the Chinese general's exploit when, on May 21, I visited the ruined fortifications reported on the steep spur overlooking the debouchure of the Baroghil stream from the west and known as *Kansir*. After riding across the level plain of sand and marsh, and then along the flat bottom of the Pitkhar defile for a total distance of about 3 miles, we left our ponies at a point a little to the south of some absolutely impracticable rock faces which overlook Pitkhar from the west. Then, guided by a few Wakhis, I climbed to the crest of the western spur, reaching it only after an hour's hard scramble over steep slopes of rock and shingle. There, beyond a stretch of easily sloping ground and about 300 feet higher, rose the old fort of Kansir at the extreme north end of the crest. Between the narrow ridge occupied by the walls and bastions and the continuation of the spur

south-westwards a broad dip seemed to offer an easy descent towards the hamlet of Karkat on the Oxus.

It was clearly for the purpose of guarding this approach that the little fort had been erected on this exposed height. On the north and east, where the end of the spur falls away in unscalable cliffs to the main valley of the Oxus and towards the mouth of the Pitkhar defile, some 1600 to 1700 feet below, structural defences were needless. But the slope of the ridge facing westwards and the narrow neck to the south had been protected on the crest by a bastioned wall for a distance of about 400 feet. Three bastions facing west and south-west, and one at the extreme southern point, still rose, in fair preservation in parts, to a height of over 30 feet. The connecting wall-curtains had suffered more, through the foundations giving way on the steep incline. Of structures inside the little fort there remained no trace.

Definite archæological evidence as to the antiquity of the little fortification was supplied by the construction of the walls. Outside a core of closely packed rough stones they show throughout a solid brick facing up to 6 feet in thickness with regular thin layers of brushwood separating the courses of large sun-dried bricks. Now this systematic use of brushwood layers is a characteristic peculiarity of ancient Chinese construction in Central Asia, intended to assure greater consistency under climatic conditions of particular dryness in regions where ground and structures alike are liable to constant wind erosion. My explorations around Lop-nor and on the ancient Chinese *Limes* of Tun-huang have conclusively proved that it dates from the very commencement of Chinese expansion into Central Asia.* At the same time my explorations in the Tarim basin have shown also that the Tibetan invaders of the T'ang period, when building their forts, did not neglect to copy this constructive expedient of their Chinese predecessors and opponents in these regions.† On various grounds which cannot be discussed here in detail it appears to me very probable that the construction of the Kansir walls was due to the Tibetan invaders of Wakhan. But whether the fortification existed already when Kao Hsien-chih carried the Tibetan main position by an attack on its mountain flank, or whether it was erected by the Tibetans when they returned after the retirement of the Chinese some years later, and were, perhaps, anxious to guard against any repetition of this move outflanking a favourite defensive position, I am unable to say.

The victory thus gained by Kao Hsien-chih on the Oxus had been signal, and it was followed up by him with the boldness of a truly great commander. The Imperial Commissioner and certain other high officers feared the risks of a further advance. So Kao Hsien-chih decided to leave them behind together with over 3000 men who were sick or worn out by

* Cf., *e.g.*, 'Desert Cathay,' i. pp. 387 *sqq.*, 540 *sqq.*; ii. pp. 44, 50, etc.

† This was distinctly observed by me in the Tibetan forts at Miran and Mazar-tagh, built and occupied in the 8th century A.D.; cf. 'Serindia,' pp. 457, 1285 *sqq.*

the previous hardships, and to let them guard Lien-yün. With the rest of his troops he "pushed on, and after three days arrived at Mount *T'an-chü*; from that point downwards there were precipices for over 40 *li* (*circ.* 8 miles) in a straight line. Kao Hsien-chih surmised: 'If the barbarians of *A-nu-yüeh* were to come to meet us promptly, this would be the proof of their being well-disposed.' Fearing besides that his soldiers would not care to face the descent [from Mount *T'an-chü*], he employed the stratagem of sending twenty horsemen ahead with orders to disguise themselves in dress as if they were barbarians of the town of A-nu-yüeh, and to meet his troops on the summit of the mountain. When the troops had got up Mount T'an-chü they, in fact, refused to make the descent, saying, 'To what sort of places would the Commissioner-in-Chief have us go?' Before they had finished speaking, the twenty men who had been sent ahead came to meet them with the report: 'The barbarians of the town of A-nu-yüeh are all well-disposed and eager to welcome you; the destruction of the bridge over the So-yi river is completed.' Kao Hsien-chih pretended to rejoice, and on his giving the order all the troops effected their descent."

After three more marches the Chinese force was in reality met by "the barbarians of the town of A-nu-yüeh" offering their submission. The same day Kao Hsien-chih sent ahead an advance guard of a thousand horsemen, charging its leader to secure the persons of the chiefs of "Little P'o-lü" through a ruse. This order having been carried out, on the following day Kao Hsien-chih himself occupied A-nu-yüeh, and had the five or six dignitaries who were supporting the Tibetans executed. He then hastened to have the bridge broken which spanned the So-yi river at a distance of 60 *li*, or about 12 miles, from A-nu-yüeh. "Scarcely had the bridge been destroyed in the evening when the Tibetans, mounted and on foot, arrived in great numbers, but it was then too late for them to attain their object. The bridge was the length of an arrow-shot; it had taken a whole year to construct it. It had been built at the time when the Tibetans, under the pretext of using its route, had by deceit possessed themselves of Little P'o-lü." Thus secured from a Tibetan counter-attack on Yasin, Kao Hsien-chih prevailed upon the king of Little P'o-lü to give himself up from his hiding-place, and completely pacified the territory.

The personal acquaintance with the ground which I gained in 1906 on my journey up the Yarkhun, or Mastuj, valley and across to Sarhad, and again on my move up Yasin and across the Darkot in 1913, has rendered it easy to trace the successive stages here recorded of Kao Hsien-chih's great exploit. All the details furnished by the Chinese record agree accurately with the important route that leads across the depression in the Hindukush range, formed by the adjacent Baroghil and Shawitakh Passes, to the sources of the Mastuj river, and then, surmounting southwards the ice-covered Darkot Pass (*circ.* 15,400 feet),

descends the valley of Yasin to its debouchure on the main river of Gilgit. The only serious natural obstacle on this route, but that a formidable one, is presented by the glacier pass of the Darkot. I first ascended it on 17 May 1906, from the Mastuj side, under considerable difficulties, and to a description of that visit and the photographic illustrations which accompany it I may here refer for all details.*

Owing to a curious orographic configuration two great ice-streams descend from the northern face of the Darkot pass. One, the Darkot glacier properly so called, slopes down to the north-west with an easy fall for a distance of nearly 8 miles, pushing its snout to the foot of the Rukang spur, where it meets the far steeper Chatiboi glacier. The other ice-stream, which on the map is shown quite as long but which reliable information represents as somewhat shorter, descends towards the north-east and ends some miles above the summer grazing ground of Showar-shur on the uppermost Yarkhun river. Thus two divergent routes offer themselves to the traveller who reaches the Darkot pass from the south and wishes to proceed to the Oxus.

The one, keeping to the Darkot glacier, which I followed myself on my visit to the Darkot pass, has its continuation in the easy track which crosses the Rukang spur, and then the Yarkhun river below it to the open valley known as Baroghil-yailak. Thence it ascends over a very gentle grassy slope to the Baroghil saddle, characteristically called *Dasht-i-Baroghil*, "the plain of Baroghil." From this point it leads down over equally easy ground, past the hamlet of Zartighar, to the Ab-i-Panja opposite Sarhad. The other route, after descending the glacier to the north-east of the Darkot Pass, passes down the Yarkhun river past the meadows of Showar-shur to the grazing ground of Shawitakh-yailak; thence it reaches the Hindukush watershed by an easy gradient near the lake of Shawitakh or Sarkhin-zhoe. The saddles of Baroghil and Shawitakh are separated only by about 2 miles of low gently sloping hills, and at Zartighar both routes join.

The distances to be covered between the Darkot pass and Sarhad are practically the same by both these routes, so far as the map and other available information allow me to judge. My original intention in 1906 was to examine personally those portions of both routes which lie over the *névé*-beds and glaciers of the Darkot. But the uncertain weather conditions prevailing at the time of my ascent, and the exceptional difficulties then encountered owing to the early season and the heavy snowfall of that spring, effectively prevented my plan of ascending from the foot

* See 'Desert Cathay,' i. pp. 52 *sqq.* In 1913 I crossed the Darkot from the Yasin side towards the close of August, *i.e.* at the very season when Kao Hsien-chih effected his passage. The difficulties then encountered in the deep snow of the *névé* beds on the top of the pass, on the great and much-crevassed glacier to the north, and on the huge side moraines along which the descent leads, impressed me as much as before with the greatness of Kao Hsien-Chih's alpine feat in taking a military force across the Darkot.

of the Rukang spur and descending to Showar-shur. In 1913 I was anxious to complete my examination of the Darkot by a descent on the latter route. But my intention was unfortunately frustrated by the fact that the passage of the glacier on the Showar-shur side had been blocked for several years past by an impracticable ice-fall which had formed at its end.

Having thus personal experience only of the north-west route, I am unable to judge to what extent present conditions justify the report which represents the glacier part of the north-eastern route as somewhat easier. It is, however, a fact that the Pamir Boundary Commission of 1895, with its heavy transport of some six hundred ponies, used the latter route both coming from and returning to Gilgit. The numerous losses reported of animals and loads show that here, too, the passage of the much-crevassed glacier and the treacherous snow-covered moraines proved a very serious difficulty for the transport. Nevertheless, inasmuch as for a force coming from the Wakhan side the ascent to the Darkot pass from the nearest practicable camping ground would be about 1300 feet less by the Showar-shur route than by that passing the Rukang spur, I consider it probable that the former was used.

Kao Hsien-chih's biography states that it took the Chinese general three days to reach "Mount T'an-chü," *i.e.* the Darkot, but does not make it quite clear whether thereby the arrival at the north foot of the range or on its crest is meant. If the latter interpretation is assumed, with the more rapid advance it implies, it is easy to account for the time taken by a reference to the ground; for, although the Shawitakh-Baroghil saddle is crossed without any difficulty in the summer after the snow has melted, no military force accompanied by baggage animals could accomplish the march from Sarhad across the Darkot in less than three days, the total marching distance being about 30 miles. Even a four days' march to the crest, as implied in the first interpretation, would not be too large an allowance, considering the high elevations and the exceptional difficulties offered by the glacier ascent at the end.

The most striking evidence of the identity of "Mount T'an-chü" with the Darkot is supplied by the description given in the record of "the precipices for over 40 *li* in a straight line" which dismayed the Chinese soldiers on looking down from the heights of Mount T'an-chü; for the slope on the southern face of the Darkot is extremely steep, as I found on my ascent in 1913, and as all previous descriptions have duly emphasized. The track, mostly over moraines and bare rock, with a crossing of a much-crevassed glacier *en route*, descends close on 5000 feet in a distance of little more than 5 miles before reaching, near a ruined "Darband," or *Chiusa*, the nearest practicable camping ground above the small village of Darkot.

Well could I understand the reluctance shown to further advance by Kao Hsien-chih's cautious "braves," as from the top of the pass I looked

down on 17 May 1906 through temporary rifts in the brooding vapour into the seeming abyss of the valley. The effect was still further heightened by the wall of ice-clad mountains rising to over 20,000 feet which showed across the head of the Yasin valley south-eastwards, and by the contrast which the depths before me presented to the broad snowy expanse of the glacier *firn* sloping gently away on the north. Taking into account the close agreement between the Chinese record and the topography of the Darkot, we need not hesitate to recognize in *T'an-chü* an endeavour to give a phonetic rendering of some earlier form of the name *Darkot*, as accurate as the imperfections of the Chinese transcriptional devices would permit.

The stratagem by which Kao Hsien-chih met and overcame the reluctance of his troops, which threatened failure when success seemed assured, looks characteristically Chinese. The forethought shown in preparing this ruse is a proof alike of Kao Hsien-chih's judgment of men and of the extreme care with which every step of his great enterprise must have been planned. But such a ruse, to prove effective, must have remained unsuspected. I believe that in planning it full advantage was taken of the peculiar configuration of the Darkot, which provides, as seen, a double route of access to the pass. If the party of men sent ahead to play the rôle of the "barbarians of Little P'o-lü" offering their submission was despatched by the Baroghil and Rukang route while the troops marched by the Showitakh–Showar-shur route, all chance of discovery while on the move would be safely guarded against. As I had often occasion to note in the course of my explorations, Chinese military activity from antiquity down to modern times has always taken advantage of the keen sense of topography widely spread in the race. So Kao Hsien-chih was likely to take full account of the alternative routes. Nor could it have been particularly difficult for him to find suitable actors, in view of the generous admixture of local auxiliaries which the Chinese forces in Central Asia have at all times comprised.*

The remaining stages of Kao Hsien-chih's advance can be traced with equal ease. The three marches which brought him from the southern foot of the pass to "the town of A-nu-yüeh" obviously correspond to the distance, close on 30 miles, reckoned between the first camping ground below the Darkot to the large village of Yasin. The latter, by its position and the abundance of cultivable ground near by, must always have been the political centre of the Yasin valley. Hence it is reasonable to assume that we have in *A-nu-yüeh* a fairly accurate reproduction of the name *Arniya* or *Arniah* by which the Dards of the Gilgit valley know Yasin.

The best confirmation of this identification is furnished by the state-

* The T'ang Annals specifically mention in the account of Shih-ni, or Shighnan, on the Oxus that its chief in A.D. 747 followed the Imperial troops in their attack on Little P'o-lü, and was killed in the fighting; cf. Chavannes, 'Turcs occidentaux,' p. 163.

ment of the Chinese record that the bridge across the River So-yi was situated 60 *li* from A-nu-yüeh. Since the notice of Little P'o-lü contained in the T'ang Annals names the River So-yi as the one on which Yeh-to, the capital of the kingdom, stood, it is clear that the Gilgit river must be meant. Now, a reference to the map shows that, in a descent of the valley from Yasin, the Gilgit river is reached at a distance of about 12 miles, which exactly agrees with the 60 *li* of the Chinese account. It is evident also that, since the only practicable route towards Gilgit proper and the Indus valley leads along the right, or southern, bank of the Gilgit river, the Tibetan reinforcements hurrying up from that direction could not reach Yasin without first crossing the river. This explains the importance attaching to the bridge and the prompt steps taken by the Chinese leader to have it broken. As the Gilgit river is quite unfordable in the summer the destruction of the bridge sufficed to assure safe possession of Yasin.*

It still remains for us to consider briefly what the biography in the T'ang Annals tells us of Kao Hsien-chih's return from Little P'o-lü. After having secured the king and his consort and pacified the whole territory, he is said to have retired by the route of "the shrine of the red Buddha" in the eighth (Chinese) month of A.D. 747. In the ninth month (October) he rejoined the troops he had left behind at Lien-yüan, *i.e.* Sarhad, and by the end of the same month regained "the valley of Po-mi," or the Pamirs.

Reference to the map shows that there are only two direct routes, apart from that over the Darkot and Baroghil, by which the upper Ab-i-Panja valley can be gained from Gilgit–Yasin. One leads up the extremely difficult gorge of the Karambar or Ashkuman river to its headwaters east of the Yarkhun river sources, and thence by the Khora-bhort Pass over the main Hindukush range and down the Lupsuk valley to the Ab-i-Panja. This it strikes at a point close to Karvan-balasi, half a march below the debouchure of the Little Pamir and two and a half marches above Sarhad.† The other, a longer but distinctly easier route, leads up from Gilgit through the Hunza valley to Guhyal, whence the Ab-i-Panja headwaters can be gained either *viâ* the Kilik and Wakhjir passes or by the Chapursan valley. At the head of the latter the Irshad pass gives access to the Lupsuk valley already mentioned, and down this Karwan-balasi is gained on the Ab-i-Panja.‡ All three passes are high, close on

* The biography of Kao Hsien-chih calls this bridge "pont de rotin" in M. Chavannes' translation, 'Turcs occidentaux,' p. 153. But there can be no doubt that what is meant is a "rope bridge," or *jhula*, made of twigs twisted into ropes, a mode of construction still regularly used in all the valleys between Kashmir and the Hindukush. Rope bridges of this kind across the Gilgit river near the debouchure of the Yasin valley were the only permanent means of access to the latter from the south until the wire suspension bridge near the present fort of Gupis was built in recent years.

† Regarding Karwan-balasi and the route along the Oxus connecting Sarhad with the Little Pamir, cf. 'Desert Cathay,' i. pp. 72 *sqq*.

‡ The Hunza valley route was followed by me in 1900. For a description of it and

or over 16,000 feet, but clear of ice and comparatively easy to cross in the summer or early autumn.

Taking into account the distinct statement that Kao Hsien-chih left after the whole "kingdom" had been pacified, it is difficult to believe he should not have visited Gilgit, the most important portion of Little P'o-lü. In this case the return through Hunza would have offered manifest advantages, including the passage through a tract comparatively fertile in places and not yet touched by invasion. This assumption receives support also from the long time, one month, indicated between the start on the return march and the arrival at Lien-yün. Whereas the distance from Gilgit to Sarhad *viâ* Hunza and the Irshad pass is now counted at twenty-two marches, that from Gilgit to the same place by the Karambar river and across the Khora-bhort is reckoned at only thirteen. But the latter route is very difficult at all times and quite impracticable for load-carrying men in the summer and early autumn, when the Karambar river completely fills its narrow rock-bound gorge.

The important point is that both routes would have brought Kao Hsien-chih to the same place on the uppermost Ab-i-Panja, near Karwan-balasi, which must be passed by all wishing to gain Sarhad from the east, whether starting from Hunza, Sarikol, or the Little Pamir. This leads me to believe that the "shrine of the red Buddha," already mentioned above as on the route which Kao Hsien-chih's eastern column followed on its advance to Sarhad, must be looked for in this vicinity. Now it is just here that we find the small ruin known as *Karwan-balasi*, which has all the structural features of a Buddhist shrine though now reverenced as a Muhammadan tomb.* We have here probably another instance of that continuity of local cult which has so often converted places of ancient Buddhist worship in Central Asia and elsewhere into shrines of supposed Muhammadan saints.†

According to the Annals the victorious general repaired to the Imperial capital, taking with him in triumph the captured king Su-shih-li-chih and his consort. The Emperor pardoned the captive chief and enrolled him in the Imperial guards, *i.e.* kept him in honourable exile,

of the Kilik and Wakhjir passes by which it connects with the Ab-i-Panja-valley close to the true glacier source of the Oxus, see my 'Ruins of Khotan,' pp. 29 *sqq.*

The branch of this route leading up the Chapursan valley and across the Irshad pass, was for the most part seen by me in 1913. The Chapursan valley is open and easy almost throughout and shows evidence of having contained a good deal of cultivation in older times; see my note in *Geographical Journal*, 48, p. 109. On this account, and in view of the fact that this route is some 18 miles shorter than that over the Wakhjir and crosses only one watershed, it offers a distinctly more convenient line of access to the Oxus headwaters from Gilgit than the former branch.

* Regarding the ruin of Karwan-balasi, cf. 'Desert Cathay,' i. pp. 76 *sqq.*; 'Serindia,' i. pp. 70 *sq.*

† For references, see 'Ancient Khotan,' i. p. 611, *s.v.* "local worship"; also my "Note on Buddhist Local Worship in Muhammadan Central Asia," *Journal of the Royal Asiatic Society*, 1910, pp. 839 *sqq.*

safely away from his territory. This was turned into a Chinese military district under the designation of *Kuei-jên*, and a garrison of a thousand men established there. The deep impression which Kao Hsien-chih's remarkable expedition must have produced in all neighbouring regions is duly reflected in the closing remarks of the *T'ang-shu:* "Then the Fu-lin (Syria), the Ta-shih (*i.e.* the Tazi or Arabs), and seventy-two kingdoms of divers barbarian peoples were all seized with fear and made their submission."

It was the greatness of the natural obstacles overcome on Kao Hsien-chih's victorious march across the inhospitable Pamirs and the icy Hindukush which made the fame of this last Central Asian success of the T'ang arms spread so far. If judged by the physical difficulties encountered and vanquished, the achievement of the able Korean general deserves fully to rank by the side of the great alpine feats of commanders famous in European history. He, for the first, and perhaps the last, time led an organized army right across the Pamirs and successfully pierced the great mountain rampart that defends Yasin–Gilgit and with it the Indus valley against invasion from the north. Respect for the energy and skill of the leader must increase with the recognition of traditional weakness which the Annals' ungarnished account reveals in his troops.

Diplomatic documents reproduced from the Imperial archives give us an interesting glimpse of the difficult conditions under which the Chinese garrison placed in Little P'o-lü was maintained for some years after Kao Hsien-chih's great exploit. As I have had occasion to discuss this curious record fully elsewhere, it will suffice to note that the small Chinese force was dependent wholly upon supplies obtained from Kashmir,* exactly as the present garrison of Indian Imperial Service troops has been ever since it was placed in Gilgit some thirty years ago.

In view of such natural difficulties as even the present Kashmir–Gilgit road, an achievement of modern engineering, has not succeeded in removing, it is not surprising to find that before long resumed Tibetan aggression threatened the Chinese hold, not merely upon Gilgit–Yasin, but upon Chitral and distant Tokharistan too. A victorious expedition undertaken by Kao Hsien-chih in A.D. 750 to Chitral succeeded in averting this danger.† But the fresh triumph of the Chinese arms in these distant regions was destined to be short. Early in the following year Kao Hsien-chih's high-handed intervention in the affairs of Tashkend, far away to

* Cf. 'Ancient Khotan,' i. pp. 11 *sqq.*; for the official documents embodied in the 'Tsê fu yuan kuei' (published A.D. 1013), see Chavannes, 'Turcs occidentaux,' pp. 214 *sqq.*

In the former place I have pointed out the exact paralled which the difficulties experienced since 1890 about the maintenance of an Indian Imperial garrison in Gilgit present to the conditions indicated by the Chinese record of A.D. 749. The troubles attending the transport of supplies from Kashmir necessitated the construction of the present Gilgit Road, a difficult piece of engineering.

† Cf. Chavannes, 'Turcs occidentaux,' pp. 158, 214 *sqq.*, 296.

the north, brought about a great rising of the populations beyond the Yaxartes, who received aid from the Arabs. In a great battle fought in July 751, in the plains near Talas, Kao Hsien-chih was completely defeated by the Arabs and their local allies, and in the ensuing *débâcle* barely escaped with a small remnant of his troops.*

This disaster marked the end of all Chinese enterprise beyond the *Imaos*. In Eastern Turkestan Chinese domination succeeded in maintaining itself for some time amidst constant struggles until by A.D. 791 the last of its administrators and garrisons, completely cut off long before from contact with the Empire, finally succumbed to Tibetan invasion. Close on a thousand years were to pass after Kao Hsien-chih's downfall before Chinese control was established once again over the Tarim basin and north of the T'ien-shan under the great emperor Ch'ien-lung.

THE MOUNT EVEREST MAPS AND PHOTOGRAPHS

TWO maps are published with the present number of the *Journal* to illustrate the papers by Colonel Howard-Bury and Mr. Mallory, read at the joint meeting of the Society and the Alpine Club held at the Queen's Hall on December 20. Since both are preliminary and rather hastily made maps of hitherto unmapped country, it is necessary to explain, more fully than could be done on the face of the maps, the origin of each.

The survey party which, at the request of the Government of India, accompanied the expedition, consisted of Majors Morshead and Wheeler, two Indian plane-tablers, an Indian photographic assistant, and the necessary subordinates. Major Morshead and his plane-tablers mapped the whole country traversed by the expedition on the scale of 4 miles to 1 inch, with the exception of the area within about 10 miles of Mount Everest, which was reserved for photographic survey by Major Wheeler. A rapid triangulation was carried from the existing triangulation at Kampa Dzong (made by Col. Ryder on the Tibet Mission of 1903–04) as far west only as Tinki; from that place the plane-table sheets are based on intersected points determined by Col. Ryder. In the valleys to the extreme west of the area mapped, bad weather obscured all the summits and made plane-tabling impossible; the map in these districts depends on a rough time- and compass-traverse by Major Morshead.

Fair tracings of the plane-table sheets were kept up as far as possible during the progress of the work in the field, and were rapidly completed on the return to Darjeeling, so that within three weeks copies reproduced by the Vandyke process in six colours were available in Calcutta, and a

* Cf. Chavannes, 'Turcs occidentaux,' p. 142, note 2. M. Chavannes, p. 297, quotes the closely concordant account of these events from Muhammadan historical records.

large number have been received in England for the use of the 1922 expedition. The area reserved for photographic survey is marked by a red line, but within this line there is shown a great deal of detail which seems to have been sketched in by the plane-tablers from without. A note states that this detail is shown only "with approximate accuracy." The photographs brought back by the expedition prove clearly, however, that this estimate is too high: the detail within the boundary should be neglected. In particular, the East Rongbuk glacier, which is the key to the position, is omitted; the main glacier is named the East Rongbuk glacier; and the name "West Rongbuk glacier" is in the wrong place.

The tracing of his first sketch-map from the photographic survey, which was covered by a letter received from Major Wheeler on December 12, was not itself received until December 28, having apparently missed a mail, and then gone all the way round by sea. For the meeting on December 20 it was necessary to produce some kind of map of the mountain area. Experiments made by Mr. Hinks showed that it was possible to measure approximately rounds of angles on the panoramas made by Colonel Howard-Bury with a 5-inch Panoram Kodak from a number of well-chosen stations east and north of the mountain. The positions of the stations could be re-sected from the few peaks whose places had been triangulated from the plains of India. When the stations were fixed, other points could be intersected, and a framework thus constructed. A careful repetition and extension of this process by Mr. Batchelor fixed the principal points east and north of the mountain. Mr. Frank Debenham, University Lecturer in Cartography at Cambridge, then kindly gave a few days' hard work to sketching the topography from the photographs; and Mr. Milne, from all this material, made the drawing which was shown on the screen at the meeting of December 20. The topography west of the mountain, for which there were no panoramas, was very doubtful.

When on December 28 Major Wheeler's preliminary map from the photographic survey came to hand, it was seen at once that it could not be reproduced as it stood, and that there was no time to do it justice by completely redrawing it for reproduction in this number of the *Journal*. It was therefore put aside for the moment, and Map II. now published has been completed by Mr. Milne from the drawing made for December 20, with further study of the photographs, helpful criticism and explanations by several members of the expedition, and the use of a compass sketch of the Rongbuk district produced by Mr. Bullock. Nothing has been taken from Major Wheeler's map, and no comparison with it has been made up to the present, in order that Map II. should be available as an eventual test of what may be done from the rapid study of panoramic photographs.

Meanwhile Map I. on the scale 1/750,000, has been reduced from Major Morshead's map, extended east of Tinki from existing Survey of India maps, and completed in the reserved area by a reduction from

Map II. There has been no time to prepare a hill-shaded or hachured plate from Major Morshead's map; but this will now be taken in hand by Mr. Batchelor, and a fully hill-shaded map should be ready for the book on the Expedition of 1921, which will be published by Mr. Edward Arnold in the spring.

Within the last few days we have received, by the courtesy of the Surveyor-General of India, typed copies of the reports made to him by his two officers, and we hope to give some account of these reports in a future number of the *Journal*. To have surveyed 12,000 square miles of new country on the 1/4 inch scale in a single season, and published a map in six colours three weeks after the return to civilization, is no mean achievement. To what, asks M. Rabot, in *L'Illustration*, is this excellent result due? To the admirable invention of a French officer: photographic survey! The claim is characteristic, but ill-founded. The late Colonel Laussedat certainly wrote books about photographic survey many years ago, but he never persuaded his own countrymen there was much in it. The Canadian methods employed by Major Wheeler were developed by Mr. Deville, the Surveyor-General of Canada. Whatever merit they have, when applied to Mount Everest, remains to be proved, and will not be known for several months yet: there are those who think that only stereographic survey can be of much effect in such wonderful country. In any case, the 12,000 square miles of survey to which M. Rabot referred owed nothing to any photographic method, French or otherwise. They were done with the plane-table, whose proper use was discovered by the Survey of India.

In discussing the photographs published in former numbers of the *Journal*, we were compelled to use the unsatisfactory method of assigning arbitrary letters for reference, or of using English descriptive names, as the North Peak. It is now time to make suggestions for a more convenient nomenclature.

Mount Everest must, as an exceptional case, retain the European name by which it has long been known to us, though we are now sure that the Tibetan name is Chomo Lungma: the mountain is so named in the passport for the expedition issued by the Prime Minister of the Dalai Lama. But successive Surveyor-Generals have resolved, in full agreement with this Society, that no more European names shall appear on Himalayan maps. Last year's expedition has discovered a certain number of Tibetan names, Chomo Lönzo for peak N 53 of the Survey—not for Makalu, which is not conspicuous from the camping-grounds in the Kama valley—Cho Uyo for Pk. 5/71L (26,867), and Gyachung Kang for Pk. 3/71L (25,990); but no names are discoverable for most of the features which figure prominently in the narrative. Our best course is then to take convenient descriptive names and turn them into Tibetan. Colonel Howard-Bury and Major Morshead had already agreed that Pk. 8/71L (23,800)

at the head of the Kharta valley should be called Khartaphu; that the isolated peak in the gap between Mount Everest and Makalu should be called Pethang peak, from the camping-ground of Pethang Ringmo opposite; and the windy pass at the head of the Kharta glacier Lhakpa La. After consultation with Colonel Howard-Bury and Mr. Mallory, Tibetan equivalents for other peaks were suggested and submitted for criticism to Sir Charles Bell on his recent return to England from Lhasa, with the following results:

The south peak of Mount Everest (28,100)	Lhotse.
The north peak	Changtse.
The north col	Chang La.
Pk. 6/71L	Khartichangri.
The group of mountains at the head of the Rongbuk valley lying like an island between the Rongbuk and West Rongbuk glaciers in front of the north-west ridge	Lingtren.
The small peak west of this in the West Rongbuk glacier, referred to as the Island peak	Lingtrennup.
The white snow-peak climbed by Mallory on August 7, at head of Kama valley	Kartse.
The peak with the long ridge climbed on July 5 near the head of the Rongbuk valley	Ri-ring.
The peak north of the Kama valley and south of the advanced base in the Kharta valley	Kamachangri.
The fine isolated rock peak west of Mount Everest and south of the West Rongbuk glacier	Pumori.
The Pethang peak	Pethangtse.

One considerable advantage of these names is that they will mean something to the Tibetan coolies, and will be convenient in giving instructions.

It is not proposed for the present to give special names to the various features of the mountain: we shall speak of the summit, the north-east shoulder, the north-eastern and northern arêtes which meet at the north-east shoulder, the summit ridge from the north-east shoulder to the summit, the north-western and western ridges enclosing the western cwm. The northern arête, which is the chosen route for the assault, is very obtuse, hardly more than a slight bend in the northern face, and for the time being it seems convenient to speak of the whole, nearly flat face between the north-eastern and north-western arêtes as the north face, although the northern arête divides it into two parts slightly inclined one to the other. The triangular face below the north-eastern arête will be called the north-east facet.

From the admirable collection of photographs brought home by the

expedition we have chosen for reproduction this month a series that illustrates pretty completely the topography of the mountain; they have, in fact, formed the principal material for the construction of Map II.

The Lingtren group (Plate 1) stand at the head of the Rongbuk valley in front of Mount Everest, but quite detached from it. Between this group and the end of the north-west ridge just appearing over the crest is a glacier pass reached by Mr. Bullock, connecting the south-western head of the Rongbuk glacier with a southern branch of the west Rongbuk, seen on the right in Plate 3.

The northern ridge (Plate 2) descends sharply to the eastern bank of the Rongbuk glacier, straight and nearly unbroken from the Changtse to the exit of the East Rongbuk glacier (Plate 9). But behind it lies the long unsuspected East Rongbuk glacier, the key to the whole problem, shown in Major Wheeler's photographs (Plates 10 and 11). This East Rongbuk glacier must have a larger basin than the main Rongbuk: many tributary glaciers descend to it from the high plateau eastward (Plate 11); it drains a large basin north of Changtse and east of the north ridge (Plate 10); and it has a broad head between the Lhakpa and the Chang La under the northern face of Mount Everest (Plates 18 and 21). Yet its glacier torrent, which runs for a mile or so under the lower end of the main Rongbuk glacier, was relatively small at the end of June, and did not in the least suggest an important glacier just out of sight round the corner.

The very interesting photograph No. 3 was taken from somewhere on the peak in the left foreground of No. 4, and is the only picture we have showing nearly the full extent of the north-west ridge, that here forms the watershed. The long narrow glacier in front of it is an affluent of the West Rongbuk: beyond it lies the deep and sombre western cwm, whose glacier drains into Nepal. Mr. Mallory reached the glacier pass looking into this cwm (beyond the end of the north-west ridge in Plate 4) and took the photograph No. 6, which shows the glacier after its exit from the cwm flowing away south into Nepal. The photograph from the same point looking up the dark western cwm at sunrise is hardly strong enough for reproduction.

The watershed crosses the pass and rises to the beautiful Pumori (the Daughter peak), whence it evidently runs along the range shown in Plate 5. But its further course is at present quite uncertain. Major Morshead in his report to the Surveyor-General makes it run through Gyachung Kang. This is difficult to reconcile with the panorama No. 10 of the December *Journal* and with other photographs more directly looking up the West Rongbuk glacier, which seems to lie south of Gyachung Kang and Cho Uyo. The glacier is described as coming from a pass leading into Nepal, but this does not help to determine the question. On discussing the matter with Mr. Bullock, it was agreed that there is nothing at present to exclude the possibility that the head of the

West Rongbuk is not far from the Khombu pass, in which case Gyachung Kang and Cho Uyo would seem to lie altogether in Tibet.

To return eastward, the approach to the Chang La from the eastern head of the Rongbuk glacier (Plate 7) looks steep and difficult: there is every reason to prefer the East Rongbuk route, which has, according to Major Wheeler, an easy medial moraine, perhaps as far as the glacier junction shown in Plate 11. The ridge to the left of Changtse in Plate 10 is the same as that seen on the right of Changtse in No. 14. The three photographs, Nos. 10; 11, 14, show between them the whole extent of the glacier, and no clear evidence of any serious icefall. The glacier seems steepest in the centre of No. 10, not far from its snout. Just above the snout, to the north, is a fine rock peak (Plate 9) which is almost certainly the "light rock peak flecked with snow" shown in Dr. Kellas' now famous photograph from the Kang La (see *Geog. Journ.*, April 1921).

The panoramas Nos. 13 to 16 were the foundation of Map II. Chomo Lönzo, Makalu, the point to the right of the big cirque south-east of Mount Everest, the summit, Khartaphu (No. 13), and Khartichangri (No. 15) were all fixed many years ago from the south. A few trials verified the identifications, and the camera stations were resected. They are shown in red on the map. Pethangtse, Changtse, Lhotse, and the unnamed peak beyond the camp on the Lhakpa La (No. 14) were then fixed by intersection, and the rest followed. It would have been easier if the panoramas had included the whole 360° instead of falling generally a little short, and this will be rectified in the next season. It would not have been difficult to determine approximate heights from these panoramas if one were certain that the camera was carefully levelled; but time has not allowed any experiments in this direction.

Plates 12 and 20 were taken from nearly the same point, just above the 20,000-feet camp on the stony terrace above the left bank of the Kharta glacier. The first is a tele-photograph, with all the curious want of perspective that is inherent in such pictures. If it were not for the cloud that has happily filled the cirque one would scarcely realize that the knife-edges, with their magnificent snow fluting, are far in front of the mountain. They are actually the rims of the great cirque at the head of the Kama valley (EL and EM of Plate 12, December *Journal*). The peak away to the right in Plate 20 is not Changtse, but the sharp peak beyond the camp in No. 14.

Plate 21 shows in profile the north arête which is seen much foreshortened in No. 19—a combination of two photographs taken with a V.P. Kodak looking right up the northern face, with the north arête to the left. It joins the north-east arête just above the pinnacles of the north-east shoulder, at about 28,000 feet. The slope from the Chang La to this shoulder is a little more than 30°; from the shoulder to the summit a good deal less until near the end, which is steep. The arête is broad, with room to circumvent obstacles. It happily avoids the nasty-looking

horizontal band of steep rock on the north face; and one could hardly expect to find a better way. But the gales of September 1921, whose effect is seen in plate 20, absolutely forbade any further progress beyond the end of the footprints seen in No. 19 in the left-hand corner.

On the way home to Kharta Colonel Howard-Bury, Mr. Wollaston, and Major Wheeler made a *détour* through the Kama valley, descending by the snow pass north of Kartse: the peak climbed by Mr. Mallory on August 7. Plate 8 shows that he was fortunate in approaching this peak from the east. Colonel Howard-Bury crossed the horribly ugly Kangshung glacier early one morning and climbed to a point on the snowy ridge immediately to the right of Makalu in No. 13, from which he took the most instructive panorama No. 20 and other excellent pictures of the inside of the Makalu and Chomo Lünzo group. Comparison with No. 3 of the December *Journal* will show how unexpectedly thin is the mass that looks so imposing from below the Langma La.

The panorama No. 17, showing the whole extent of the upper Kama valley from the south, was taken lower down on the way back to the camp at Pethang Ringmo, from which Mr. Wollaston obtained two photographs of Chomo Lönzo that are technically the finest of all the pictures taken this year. Enlargements from these plates were shown at the Alpine Club Hall exhibition, and are in the photograph room of the Society: it is not possible to do justice to them in the small page of the *Journal*.

In choosing the photographs here reproduced we have kept close to Mount Everest: the many beautiful pictures taken further afield and on the way back down the Chumbi valley have been set aside for the moment, with one exception. It is necessary to close this series with a mountain 35 miles west of Mount Everest, much inferior in height, much superior in beauty: Gaurisankar. Many years ago two Germans mistook it for Mount Everest; and though the error was soon detected, and the Survey of India took special pains to dispose of it, the name Gaurisankar appears as alternative to Mount Everest in one of the best and most recent atlases, and is still frequently used in certain countries of Europe. There have even been applications from persons abroad to join the Gaurisankar Expedition!

REVIEWS

EUROPE

Catalogue des Guides-Routiers et des Itinéraires Français, 1552–1850.— Sir H. George Fordham. Paris: 1920. Pp. 47. *Maps.*

Ditto: *Illustrations Supplémentaires.*— Cambridge. 1921.

The Earliest French Itineraries, 1552 and 1591.— The Same. Oxford University Press. 1921. *Facsimiles.*

THE catalogue of Road-books and Itineraries of France is a valuable addition to the author's publications in carto-bibliography. The period covered commences with the work of Estienne, 1552, and closes with the change in

road and railway communications in the middle of the nineteenth century. The catalogue gives a short introduction to the motives of travel during that period and the need of itineraries for pilgrims and merchants. In 'The Earliest French Itineraries,' the author has supplied at some length an account of the works of Charles Estienne and Thédore de Mayerne-Turquet and their results on subsequent cartography. It contains numerous facsimile impressions of title-pages and of the text, and these are collected and amplified in the 'Illustrations Supplémentaires.' W. H. B.

Motya, a Phœnician Colony in Sicily.— **Joseph Whitaker.** London: G. Ball & Sons. 1921. 30*s. net.*

This is a valuable contribution to Sicilian history and archæology. Motya lies on a small island, connected with the shore by a causeway, in the bay north of the modern port of Marsala. Occupied at an uncertain but quite early date by Carthaginians, it remained a principal centre of Punic influence in western Sicily until its destruction by Dionysius of Syracuse in 398–7 B.C. It was never rebuilt, because the Marsala site was already found to be more commodious, and the Punic town of Lilybæum, which grew up there, took Motya's place as port and arsenal, while Panormus further north took much of the commercial traffic, and has survived in modern Palermo. Unencumbered, therefore, by later ruins, though probably much plundered for the building of Lilybæum, and afterwards, Motya offers the most favourable conditions for the study of the earlier phases of Carthaginian enterprise and culture. Mr. Whitaker has spared no pains, during many years, to recover the history of Motya from its ruins. He has traced and cleared the walls and gateways, and an artificial harbour of great interest for students of this type of engineering; and has made trial excavations on house-sites within the town. Much, no doubt, still remains to be found at Motya, when work on a larger scale becomes practicable; but Mr. Whitaker, with exceptional opportunities for close and prolonged study of the site, has established the main outlines, and presented his results in a scholarly and convenient form. J. L. M.

Essays on the Latin Orient.— **William Miller, M.A.** Cambridge University Press. 1921. 8vo. Pp. viii., 582. *Map and Illustrations. Price* 40*s. net.*

In this volume the learned author of the 'Latins in the Levant' has republished a number of articles on the history of the Latin Orient and Balkan lands, revised and brought up to date. The periodicals in which these articles appeared are named in the preface, but as precise references are not given, it is only the reader who already knows the literature of the subject who will identify them without some trouble, or appreciate the corrections which Dr. Miller now finds it desirable to make in them. For others the book will be practically new ground; prolegomena, sequel, and context to the 'Latins in the Levant,' in six main divisions, dealing respectively with Roman, Byzantine, Frankish and Venetian Greece, the Genoese Colonies, Turkish Greece (covering the period from 1460 to 1684), and the Venetian Revival, from 1684 to 1718, followed by a cluster of miscellaneous essays dealing more briefly with such subjects as the mediæval Serbian Empire, pre-Turkish Bosnia, and the Latin kingdom of Jerusalem. To some sections a short list of authorities is appended; others have fairly full footnotes, others, again (such as that on Venetian Crete and the mediæval Serbian Empire), almost none. The price seems high even for a book published under modern conditions by the Cambridge Press.

The Battlefields of the Great War.— Douglas W. Johnson. New York: American Geographical Society, Research Series No. 3; London: H. Milford: Oxford University Press. 35*s. net.*

IN this book we have a valuable contribution to the study of the Great War. It is a study of the geography of the battlefields, and divides the Western Front into five sections: Flanders, the Somme, the Marne, Verdun, and Lorraine. The Italian theatre is divided into the Trentino and the Isonzo, and the Balkans are treated as one geographical unit. Its interest to soldiers will be profound, for it will serve as an admirable introduction to the study of all those campaigns the issues of which have been decided on the battlefields of North-Western France, whilst the sections on the Italian and Balkan theatres are no less interesting historically. There will be many of us who have travelled over, and worked in, most of the country described, during the war, and to these especially do I recommend this book. They will find it clears up, indexes, and pigeon-holes impressions now perhaps half forgotten, explains many topographical troubles, and recalls many charming views. Probably all will wonder why we had no such geographical description of the Western Front during, instead of after, the war. No doubt books and maps did exist giving similar information. There were, for example, Demangeon's book on Picardy, and the geological maps of France on the 1/80,000 scale, but the material was not collected and published in a comprehensive handy form. Here we have a geographical, geological, and topographical guide, giving us the right amount of information on each head with due generalization, and no undue emphasis, and so arranged as to facilitate a detailed study of each of the main sections of the Western and Balkan Fronts. The regular soldier is however, by training, a topographical expert. Much, then, as he will be interested, its chief value will be for those to whom an unkindly fate has denied an active life in open country, and the sections in which the operations on each battlefield are outlined will be of more value to them than to professional students. Much the same applies to the geological information which is given. The professional soldier can usually reckon on knowing the general characteristics of the area he has to fight over, even if he cannot explain the natural causes for those characteristics. No one digging for his life in Flanders clay would feel much interested in a pervious stratum some 500 feet below the scene of his labours; but this information will be welcomed by the engineers and others, to whom a handbook such as this would have been so useful during the war itself. No intending reader need be frightened by the introduction of geology. The simple and somewhat generalized information given is not only easily understood, but does much to explain the course of events in each of the sections chosen.

In his introduction the author alludes to those new methods of Artillery Intelligence, Sound Ranging, and Flash Spotting, and the more or less precise surveys necessary to their proper working. He points out, and with justice, that their introduction has not affected the value of topographical command. It may be that these recent additions to the military surveyor's task have been so emphasized as to leave a false impression on the minds of some. If so, this book will act as a corrective. The surveyor can, and did, do much to locate counterbattery targets, whether the ground helped him or not. He made it possible to open fire upon located targets without previous registration, without observation, and without warning; but in active operations the "opportunity" target must, generally speaking, be engaged with direct observation.

The book itself is well illustrated with photographs, diagrams, and extracts

from maps. The photographs are admirably chosen and well reproduced. They will prove of the greatest value to those who have no personal knowledge of the various battlefields, and to those who have will be a welcome memento. The diagrams and sketch-maps are clear and well suited to their object, and the few actual maps satisfactory enough. In the separate pocket, which accompanies the book, are a selection of 1/300,000 maps, a few block diagrams, and some panoramas. As before, the panoramas (mainly from Italian official records) are admirable. The block diagrams, however, are not very convincing, and the maps are unworthy of the volume. They are reproduced in black, from the French 1/200,000 staff-map, and the result is almost illegible. It would have been preferable to redraw for the smaller scale, or else to have enlarged from the 1/500,000, and if the maps so constructed had been layered, the block diagrams could well have been dispensed with. Students will find, however, that the French coloured 1/200,000 sheets themselves, procurable from the Service Géographique de l'Armée, are admirable.

This book whets the appetite. One would like to see a second volume dealing on the same lines with the Eastern Fronts, including Palestine and Mesopotamia.

Binding and printing leave nothing to be desired. H. St. J. L. W.

AFRICA

Twenty-Five Years in East Africa. Rev. John Roscoe, M.A.— Cambridge University Press. 1921. *Price 25s.*

The reviewer to whom this work was submitted is obliged to confess that he has read it with considerable disappointment and with some surprise that its writer had decided to publish it. The Rev. John Roscoe has done so much better work in the 'The Baganda' and 'The Northern Bantu' that any reader acquainted with the last thirty years' history of East Africa and Uganda must feel surprise that he should have thought the book under review worth issuing. From certain passages in his preface, he himself on his return from an ethnological journey into western Uganda seems to have felt somewhat embarrassed at finding this book already in the press. The portions of it really valuable in a study of African Anthropology have already appeared in the author's previously published works. Much else is not merely a twice but a four-times told tale by previous explorers and missionaries. There are several serious misspellings or purposeless misrenderings of place or tribal names (Luenzori and Ruerzori for Ruwenzori, Usakuma for Usukuma, and so on). We may hope for a very superior style of work when Mr. Roscoe has had the time to print and publish the outcome of his recent journeys ; meantime we can only regret that his friends should have sent out for publication a work evidently compiled a good many years ago, and (except in the studies already published elsewhere) one which was lacking in novelty as regards the story it had to tell.

A South African Geography.— **Prof. E. H. L. Schwarz.** London : Blackie & Son. 1921. Pp. 262. *Illustrations and Maps. 7s. net.*

From the preface we learn that this book was written to conform with the syllabus in geography drawn up for the University of South Africa, and we gather that it is intended to carry students up to the standard required for graduation in arts or science. If that is so, it is not a little disquieting from an educational standpoint to find that more than half the book is devoted to the regional study of Africa and African islands, while the remainder is occupied by a very sketchy treatment of some of the principles of general geography. But

apart from the restricted scope of the syllabus as interpreted in this book, the general introduction contains many statements to which exception must be taken. On p. 42 the author states there are three types of coast-line: (1) the perfectly straight one caused by faulting; (2) the coast-line formed by a border of mountains with few or no inlets; (3) the "rias" coast-line: an utterly inadequate geographical treatment of coast-lines even if the examples he cites were in all cases correct. The statements that "the Baltic is so landlocked that the water is almost fresh," and "the Black Sea so deep that fish can only live in the surface layers" (p. 46), are both incomplete. It is misleading to say that "in cold countries or in mountainous regions above the snow-line, the water is frozen and rivers of ice or glaciers are found" (p. 53), or that "icebergs are responsible for a good deal of the adverse climatic conditions of the west coast of Africa" (p. 54). The treatment of the monsoons is absurdly scrappy (p. 67); the sirocco does not blow "from the burning sands of the Sahara" (p. 69), and if the "Gulf Stream brings warmth to Europe" the statement needs amplification. St. Helena is not a relic of an old land connection (p. 91), llanos are not equatorial forests, while the latter are not the only virgin forests (p. 92). "Coal occurs in two distinct varieties, the northern and the southern" (p. 126), is a statement which requires but does not receive an explanation. There is no evidence that the rollers of Ascension are due to "the meeting of the Benguela current and the equatorial current flowing south" (p. 249). But we need not lengthen this catalogue of criticisms. The regional chapters are less open to objection, but the book is not to be recommended.

R. N. R. B.

The Rift-Valleys and Geology of East Africa.— **J. W. Gregory, D.Sc., F.R.S.** London: Seeley, Service & Co. 1921. Pp. 479. 20 *Plates* (*including* 5 *Maps*). 21*s. net.*

More than a quarter-century ago the author of this work, then on the staff of the British Museum, was attached as geologist to an expedition to an almost unknown region of East Africa. The expedition had been badly planned, and collapsed before it left the coastal region; but the author sprang into fame as an explorer by quickly re-organizing it and successfully carrying out the original plan. After this long interval he has revisited the same region, but this time by railway and motor car, and with the welcome and aid of British residents, instead of the suspicions of savage chiefs. The result is a book much less attractive to the general reader than 'The Great Rift-Valley,' but having the same keynote—the conception of East Africa as the greatest fracture-zone exposed to man's observation on the globe. This conception, formulated almost simultaneously only thirty-five years ago by the French and Austrian geologists Douvillé and Suess, was elaborated by the latter in 'Das Antlitz der Erde.' To the enthusiastic advocacy of this idea by Prof. Gregory himself is mainly due its familiarization in England to the extent that in every elementary text-book of geography now the African "rift-valleys" take as honoured a place as the trade-winds or the Gulf Stream. Cynics may say that no scientific theory receives this canonization until it is dead, but the severest critic of the rift-valley theory will not deny its vitality. Let us rather say that it has left its chrysalis-case buried in the school books, and has to prove its capacity for self-preservation in the open scientific world. The danger of a very striking and widely applicable generalization is that investigators may be led by it unconsciously to pick and choose their observations, shutting their eyes to anything that seems to contradict it. Then, when at last some one is

bold enough to point out an exception, every one suddenly realizes that he knows of exceptions too, with the possible result that the theory is discredited as hastily and uncritically as it had been accepted. Something like this stage may be approaching in the case of the rift-valley theory, and Prof. Gregory has therefore very wisely brought together in this book a great mass of detailed evidence, both from his own observations and from the voluminous literature of the subject, on the existence and nature of the African rift-valleys. He has produced an immense number of facts that are at least consistent with the rift-valley theory ; but it may be doubted if its opponents will be convinced. There is one crucial test—the finding under the valley floor of some formation, say, the Duruma sandstone, which unquestionably antedates the valley itself, and is either known to occur high up on the riven plateau, or is of later date than rocks in that position. No such formation has been found : the rift-valleys are floored either by lake deposits, obviously younger than the valley itself, or by lavas which might have been poured out over plateau and valley alike. Some of Prof. Gregory's geological sections (Figs. 20 and 21, for instance) look absolutely conclusive, until we ask how far they represent ascertained fact, and how far inference with the rift-valley theory as major premiss. Then we realize that, for instance, the four successive lavas below the alluvium of Lake Magadi have not been proved by a boring.

After making full allowance for all these matters of doubt, we must say that the rift-valley theory does appear to explain the physiography of East Africa better than any other, though it need not necessarily apply to all the features which are referred to it. Because Tanganyika is best explained as a rift-valley, we need not conclude that the Red Sea must be another.

Apart from the discussion of the main theory, this work contains much valuable information on East Africa, partly new and partly brought together for the first time from widely scattered sources. The author now considers that the tectonic and volcanic history of the rift-valleys goes back much farther in time than he originally thought, and makes out a good, though not conclusive, case for the oldest (Kapitian) lavas being contemporaneous with the Deccan "traps." He does not, however, offer any explanation of the fact that the African lavas are of the alkali or "Atlantic" type, while the Indian lavas are of the sub-alkali or "Pacific" type.

Interesting information is given on prehistoric remains and various matters of practical interest such as mineral resources and water-supply. The story of the edible cave-earth which is scented from afar by donkeys that have never tasted it before, reads like an Arabian Nights version of a salt-lick, and though the soda-value of this earth is verified by chemical analysis, the scenting of sodium silicate is a marvel unexplained.

Altogether the book forms an indispensable addition to the literature of East Africa. A. M. D.

AMERICA

Californian Trails : The Story of the Californian Missions.— Trowbridge Hall. New York : Macmillan & Co. 1920. 26*s. net.*

We have here an interesting account of the inception and subsequent development of the early Spanish Mission to the "Pacific Slope." No pretence is made to any original research, for the result of which the writer very properly refers his readers to the more elaborate works of Bancroft, Hittel, and Engelhardt. Mr. Hall simply chronicles in a pleasant way the result of an extended motor trip among what still remains of the older mission churches

and monastic establishments north of the Mexican frontier, of which he visited in all over thirty.

The province gradually occupied by these pioneers was that comparatively narrow strip of country between the Californian mountains and the sea. It was of alluvial origin, very fertile, not intersected by any large rivers, and of ready access from the sea, conditions which much facilitated at a later date the construction of one main central and northern road. This enabled the mission stations as they were gradually built to be easily connected together. California was not always the land of gardens and grain-growing it is now. It was undoubtedly the rude efforts of these missionary priests that first opened up its native wealth, and, when the gold rush of 1849 came, afforded to the miners the means both of support and inter-communication. The author has some good notices of the scenery he travelled through, and says much of the beauty of the road between the mission house of San Buena Ventura and Santa Barbara. It is no doubt in part to the purity of the atmosphere that we owe the excellence of the photographs with which the itinerary is illustrated. They give an excellent notion of the architecture of these old churches and stations, with their large patios, towers, and belfries, their ancient orange and olive trees. In the inner life of these patient and earnest men there is much that we cannot but contemplate with respectful admiration. A. L. F.

POLAR REGIONS

The Great White South.— H. G. Ponting. London: Duckworth & Co. 1921. *Illustrations and Sketch-map.* 30*s.*

Mr. Ponting's book deals with the main events of Captain Scott's last expedition; it contains no fresh matter, however, and as the author does not appear to have ventured more than a few miles from the hut at Cape Evans, sledging experiences are notably absent. The illustrations, most of which have already appeared in 'Scott's Last Expedition,' are excellent, and set a very high standard for future camera work in the Antarctic. Mr. Ponting, indeed, would have done more towards sealing his reputation as an artist had he suppressed the letterpress entirely and supplied us instead with a portfolio of his photographic work, suitably reproduced.

GENERAL

Geography, Physical, Economic, Regional.— J. F. Chamberlain. Pp. xviii., 512. London: J. B. Lippincott Co. 1921. *Illustrations and Maps.* 15*s. net.*

Although this volume is one of Lippincott's School text series, we gather from the preface that it is intended also to interest the general reader. It is essentially a study of economic geography in its widest sense, and although the author claims that physical geography is presented as a necessary foundation the physical basis is very slight, especially in regard to land forms and weathering agencies. Thus the physical treatment of rivers covers barely six pages, and that of mountains considerably less. The term "icefoot" for the front of a glacier is not a happy choice, and while it may be of interest it scarcely has geographical value to state that "woollen stockings drawn over one's shoes prevent slipping" (on glaciers). The chapters on the distribution of crops, forest product, animals, and minerals are good, but curiously enough there is no mention of whaling. The last hundred pages are devoted to a regional treatment of the United States and overseas American possessions, in which chief emphasis is again laid on the economic side. The author succeeds in

making economic geography interesting and by noting causal relationships avoids the mere record of uncorrelated facts, but in trying to compress too much into a single volume is somewhat sketchy in places. However, for the general reader the volume should prove of value. A word of praise is due to the illustrations, excellent both in their choice and production. There are also a number of coloured maps and many useful bibliographical references. The volume is certainly cheap as prices go nowadays. R. N. R. B.

The Study of Geological Maps.— Gertrude L. Elles, D.Sc. Cambridge: University Press. 1921. Pp. viii. + 74. 64 *Figures and a Folding Map. Price* 12*s.*

It is significant of the increasing interest taken in maps of all kinds that whereas twenty years ago no publisher would look at a proposal for a book on geological map-reading, Cambridge alone produced two works on the subject last year. Dr. Elles's book and the one by Prof. Harker recently noticed in these pages need not be regarded as rivals, but are rather supplementary to one another. The present work deals less with the geometrical aspect of the subject, and more with the interpretation of actual selected sheets, while it also treats at some length of topographical features which have a geological meaning. The illustrations, both original and from published sources, are excellent. The only point for serious criticism that we have noticed is the construction of Fig. 17. This deals with a problem that is strictly insoluble, but the method involves the most improbable assumption that a violent change of strike occurs at the very points where dips are observed. A better method would be the sketching of curved stratum-contours crossing the dip-lines at right angles.

A. M. D.

THE MONTHLY RECORD

EUROPE

The Shumadia, or "Forest" of Serbia.

AN instructive study of the Shumadia, the most distinctly marked of the natural regions of Serbia, is given in the *Annales de Géographie* for July and September 1921 from a MS. left by the late Gaston Gravier, one of the many promising French geographers who fell victims to the war. It was intended as the first of a series of such studies on the natural regions of Serbia. Broadly speaking, the Shumadia occupies the more or less elevated block of country, elongated from north to south, which rises between the Save–Danube plain on the north, the great Morava on the east, the valley of the Kolubara on the west, and that of the western Morava on the south. The name has been in general use only a century and a half at most, having come specially into vogue at the time of the wars of the early nineteenth century, since which it has often been applied by outsiders to the whole of independent Serbia, though understood by those within the country as signifying the central core only, and in course of time coming to apply more especially to the southern more elevated and wooded portion of this. By position, history, and population it constitutes the true heart of the country, and a "Shumadinac" is almost a title of nobility in the minds of other Serbians. Although it appears as an elevated tract as seen from all sides, it is only in the south and south-east, in the angle formed by the junction of the two Moravas, that it acquires anything like a moun-

tainous character and merits its name of "Forest." The northern half has an even surface, varied only by isolated bosses. As a whole, however, it has a distinct unity, as a moderately elevated plateau sharply divided off by well-marked depressions from the more mountainous areas which partially surround it. Structurally, too, it differs from the neighbouring regions, for though its foundation of ancient rocks is in close relation with the great Rhodopean massif to the south-east, and its protuberances too are mostly ancient, large areas are clothed with young and friable sediments, while it has escaped the folding to which the tracts to the east and west have been subject, the effects of tectonic forces being seen rather in a series of dislocations, which have differentiated its own surface into a series of "horsts" (since modified by erosion), beside defining its limits with the surrounding areas. In many ways the Shumadia presents striking analogies, both of relief and structure, with the Central Massif of France, though all is on a reduced scale. Special attention is given by the writer to its lacustrine history, for owing to the absence of a sharp dividing line on the north, a large part was formerly covered by lakes associated with the great inundated zone of Pannonia. Its present valleys, of the radiating type, are all of recent origin, and have done little so far to modify the old relief, though by reason of their open character and radiation from a common centre they have played an important *rôle* in the history of the country. The second article is devoted to a consideration of the forest covering in its relation to the people. As affording a safe retreat and base from which warlike operations could be organized, it no doubt helped largely in the emancipation of the country from the Turk. It has since suffered enormously at the hand of man, and the whole northern half has been almost entirely laid bare, partly no doubt by reason of its nearness to the capital. The higher Shumadia has suffered less; but even here the true forest has been preserved only on the summits and on certain lands belonging to the monasteries. The dominating forms are the beech and oak, the former chiefly at higher, the latter at lower, levels. Where the ancient forest has disappeared its place is taken by low brushwood of a more mixed character, the destructive influence of sheep and goats preventing the growth of full-sized trees.

ASIA

An Ancient Gold-Mine in Arabia.

Arabia is one of the few remaining countries in which it is still possible for historical study to throw light on present-day geography. Such is the incidental result of an investigation into the site of an ancient gold-mine, spoken of by the early Arab historians and geographers, which has been undertaken by Prof. Casanova and described by him in an interesting paper in the *Bulletin de la Section de Géographie*, 1920, of which a reprint (dated 1921) has lately been received. The former existence of such a mine was first brought to the Professor's notice a quarter of a century ago through two specimens of an Arab gold coin dating from A.H. 105 (A.D. 727) which bore an unusual inscription, "Mine of the Chief of the Faithful in the Hijaz," and his studies have since suggested that the mine in question was one frequently mentioned by ancient writers, inasmuch as the conveyances by which it changed owners have been much quoted in Mussulman jurisprudence. One of its possessors was the Khalif 'Omar ibn 'Abd al 'Aziz, who died four years before the date of the coins above mentioned. The mine was said to be situated near Al Furu, itself placed by Yakut in the district of Ar Rabadhat, 8 *barids* or stages from Medina on the road to Mecca. (This would be 96 Arabic miles, probably about the equivalent of 192 kilometres.) According to Bakri, the district of Al Furu

included Sawarikiyat, a place still in existence and thus supplying a further clue to the locality of the mine. Still another is its association with the Banu Sulaim, a tribe which has since disappeared, but whose habitat is roughly defined by historical references. The mine of the Banu Sulaim gave its name to a station on the direct route from Baghdad to Mecca, and it thus becomes necessary to study the course of this route, and the positions of the places it passed through, as well as of other ancient routes, such as the eastern road from Medina to Mecca which joined the former, and the route from Basra to Medina which crossed it. This Prof. Casanova does with great thoroughness, making full use of the data supplied by travellers like Burton, Huber, and Doughty, and also of the best modern maps, especially Hunter's and the Medina–Mecca sheet published in 1916 for the Arab Bureau at Cairo. The latter shows the Medina–Mecca road with considerable detail, but beyond Sufainat, where the road from Baghdad comes in, the track marked is that known as the *Zubaidiyat* (that described by Burton, which derived its name from the wife of Harun al Rashid), while the ancient Baghdad–Mecca road spoken of by the early writers seems to lie further east, and is not marked on any map except (diagrammatically) on Hunter's. The task of reconciling the various conflicting data is no easy one, but Prof. Casanova seems to have reached some amount of success by means of a careful study of the old Arab authorities, which has enabled him to point out where, in his opinion, recent map-makers have gone wrong. From its relation to other points whose position is thus established the mine is placed by him in about 23° 30′ N., 41° 20′ E., on the basis of the position for Medina accepted by Hunter and the map of 1916.

Correction to Tigris Corps Map in the Lesser Zab Region.

The excellent survey work done in Mesopotamia during and since the war by British officers is well known. That referring to the region of the Tigris is embodied in a series of sheets known as Tigris Corps Maps, which are from time to time revised by the issue of "Appliqué Slips" showing the corrections involved by new work in the field. An important correction to the course of the Qarachulan Su, a southern tributary of the Lesser Zab, has been notified to us by Mr. C. C. Garbett, from the Secretariat of the High Commissioner for Iraq, in the form of an extract from a report of the Civil Surgeon, Sulaimani, dated 29 October 1921. Referring evidently to some recent exploratory work, the report says, "In particular the true course of the Qaracholan River was determined, for while by T.C. 230 the course runs to a confluence with the Zab in Square AA4 (B), it actually runs due north, and the confluence is in Square AA7 (A) about 50 miles further up the course of the Zab. It breaks through the mountainous country of Mawat by immense gorges." The sheet in question covers the district round Sulaimani, between the Lesser Zab in the north and the Sirwan in the south, and is on the scale of 4 miles to the inch. Further details of the exploration will be awaited with interest.

AMERICA

Central Florida.

In the thirteenth Annual Report of the Florida Geological Survey, Mr. Roland M. Harper gives a summary of the physical and human geography of the central zone of Florida, in continuation of a similar study of northern Florida published in 1914. As much of the authentic information is buried in statistical reports, while the more popular literature often shows a too favourable bias, the author hopes that the present summary will be serviceable to intending settlers and others by presenting accurate and impartial information.

While grateful for such information, the geographer may regret the lack of a broad outlook which might have made it easier to seize the general features of the country. The study begins with a detailed account of the ten regions into which the author divides central Florida, with no indication, beyond the designations of the regions, of the basis on which the subdivision is made. Even the designations are not in all cases intelligible to the outsider without considerable study of the descriptions which follow. The second region, *e.g.*, is described as the "Gulf Hammock region," which is said to have no exac counterpart anywhere in the United States, but we have to go to the detailed description to learn what are its characteristics, and even then we find no definition of the term "hammock," which occurs in the names of two other regions also. The Gulf Hammock region is remarkably flat, and underlain throughout by hard limestone which frequently crops out on the surface. The coast is bordered by marshes instead of sandy beaches, there being practically no wave-action owing to the gentle inclination of the sea-bottom. The character of the various regions of "flatwoods" and the "Peninsula lake region" are more readily grasped through their designations, but the "Lime-sink region" conveys little definite impression until it is gathered from the description that the greater part is underlain by a comparatively pure limestone of Upper Eocene age, the solution of which has presumably formed the many basins in the surface covering of sand which characterize the region. Its highest elevations are only a little over 200 feet above sea-level. In all this descriptive portion full attention is given to the soils and vegetation, which is, we believe, the writer's more special subject. Some attempt is made to describe the general features of Central Florida in the next section of the report, but, as Mr. Harper allows, the treatment is somewhat empirical, since the peculiar nature of the configuration makes it difficult to gauge the processes by which it has been brought about. Surface erosion is probably an insignificant factor, on account of the low altitude, sandy soil, and subterranean drainage. The highest point in all Florida, the summit of Iron Mountain, is thought to be only 324 feet above sea-level. The most valuable mineral is the phosphate rock, the highest grade being the hard rock of the Lime-sink region. In this general section there are again valuable accounts of the principal soils and vegetation regions, as well as statistics of climate, fauna, population, occupations, etc. The various elements of the population—native or foreign, white or negro, urban or rural—are worked out in percentages. The course of agricultural development is carefully traced from 1850 onwards, with data of percentages of the total surface farmed, and of improved land, at various dates, the average acreage of farms, the number of stock, the use of fertilizers, value of products, and so on. Information is also given as to the winter resorts, which attract many visitors, and as a source of revenue rank close to the products of the phosphate mines, forests, and farms.

MATHEMATICAL AND PHYSICAL GEOGRAPHY

Washington as Surveyor and Map-maker.

We have received from Mr. P. Lee Phillips, the well-known curator of the map-collection of the U.S. Library of Congress, an article by him on the above subject extracted from the *Daughters of the American Revolution Magazine* for March 1921. Washington's early work as a surveyor has been so overshadowed by his later achievements in another field that it runs the risk of being forgotten. The position of a surveyor in those days, when such large areas in the United States were comparatively unknown, and when the limits

of ownership of land were but ill defined, was one of much consideration, and there is no doubt that the knowledge of the country thus gained by Washington stood him in good stead later as a military leader. His choice of a profession was made in 1747 at the early age of fifteen, and among the many original plans and drawings from his hand preserved in the Library of Congress there is a Survey of Mount Vernon made by him at about that age, and also a 'Book of Surveys, began (*sic*) July 22nd, 1749.' Another early piece of work only lately brought to light is a survey and plan of the town of Alexandria, of 1748 and 1749, the former marking the area of fifty-one odd acres to be covered by the town, the latter showing the eighty-four lots into which it was divided for the purpose of sale, a list of purchasers being added. Mr. Phillips considers that the finding of this plan gives support to the idea that the designing of the city of Washington was also largely Washington's work. A map of interest from its description of Washington's engagement with the French in 1754, though not his own work, is one entitled "An accurate map of the English Colonies in North America bordering on the River Ohio." It is reasonable to suppose that Washington made maps when participating in the colonial wars of this period, but only one has come down to us—a manuscript sketch of Fort Cumberland preserved in the Jared Sparks Collection. A map copied by Washington himself from the original surveys of 1771–75, and showing the grants of land on the Great Kanawha in which he was interested, both on his own behalf and in that of other officers, is described in full by Mr. Phillips. It measures about 65 × 22½ inches, and notes concerning each survey are inserted in the spaces which would otherwise be blank. The actual surveyor of these lands was Washington's agent, William Crawford. One of the last maps made by Washington in (1784) is entitled "Sketch of the Country between the Waters of Potomack and those of Youghagany and Monongahela as sketched by General Washington," and shows his interest in inland navigation. A still later drawing of the General's, reproduced in 1801 in a work printed in London and embracing letters written by him to Arthur Young, is "A Map of General Washington's Farm of Mount Vernon." The original drawing accompanied a letter written to Young in 1793. The article reproduces a number of maps and plans either by Washington himself or bearing on his work.

Source of Underground Waters.

A *résumé* of some extensive researches, not published in detail in consequence of the political upheaval in Russia, by Prof. P. Ototzky, President of the Hydrological Committee of the Russian Geographical Society, appeared in the *Quarterly Journal of the Royal Meteorological Society* for January 1921. The effect of various meteorological factors upon the level of subterranean water is dealt with, and special interest naturally attaches to that of rainfall. The conclusions are somewhat disconcerting to preconceived notions. The issue is stated as between the two old opposing contentions: (1) all underground waters are produced by the infiltration of rain-water; (2) not a single drop of rain-water passes into underground water. Ototzky favours the negative conclusion, in so far as the great Russian plain and similar regions in middle or high latitudes are concerned, pointing out that there is often a very dry layer known as "dead" between the soil and the underground water-table. It is shown that in such regions a rise in the level of well water follows *immediately* after a fall of rain, which could not be the result of infiltration, and that the cause is the depression of the underground water-table due to the increased pressure of gases in the soil. A rapid rise of well water together

with an increase in the flow of springs follows also the melting of snow in spring over vast plains. It is stated that when a rise in the level of the water-table occurs it is brought about by water flowing into it horizontally, and presumably this is held to be the main source of supply for subterranean water in such regions. These conclusions are based upon investigations confined almost exclusively to stagnant or sluggish water in flat regions in middle latitudes, where it is found that the infiltration of precipitation to a considerable depth is restricted to areas with abundant fissures. The conclusions do not apply to the different hydrological regimen of tropical countries, or to the underground torrents of mountainous regions. The upshot of the matter seems to be that in flat temperate regions the vertical percolation of rain-water though the soil is much more localized than is commonly supposed, and cannot be the chief source of subterraneous water.

GENERAL

Unsuccessful Search for the Nimrod and Dougherty Islands in the South Pacific.

It will be remembered that when returning himself by the nearest route from his first Antarctic Expedition in 1909, Sir Ernest Shackleton arranged for the Expedition's ship, the *Nimrod* (Captain J. K. Davis), to take such a course as might help to clear up the reported existence of certain small islands or groups of islands in the Southern Ocean. As recorded in the *Journal*, vol. 34, p. 347, the search proved in every case unsuccessful, and the result was to throw increased doubt on the accuracy of reports of land in the positions in question. We have received from Captain C. C. Dixon, of the s.s. *Canadian Navigator*, the copy of a chart showing his tracks in the neighbourhood of the supposed positions of two of the above islands, Nimrod and Dougherty, during a voyage across the South Pacific, made apparently in 1918, which equally failed to confirm the existence of land in the supposed localities. Between March 19 and 26 his track made a zigzag course between 54° 30′ and 57° 30′ S. and between 164° and 157° W. (the reported position of the Nimrod islands being in about 56° 30′ S., 158° 30′ W.). The chart shows by dotted lines the area in which an island 50 feet in height would have been seen, and as the conditions of visibility appear to have been good for a fair part of the time, especially when in the vicinity of the reported position, the existence of such an island has been shown to be impossible for a considerable part of the area. Special attention was given to the birds observed, and only on March 20 and 21 was there any marked increase in the numbers seen. This was to the west-south-west of the supposed position of the group, and it would therefore be in this direction that land might be supposed to lie, if really existent, especially as some kelp was also observed between the afternoon of March 20 and the morning of March 21. The reported position of Dougherty island (59° 30′ S., 119° 10′ W.) was passed on April 2, under conditions of visibility described as very good, some of the icebergs which were met with both on the 1st and 2nd remaining in sight on the latter day until over 25 miles away. The height of the look-out above sea-level was 122 feet, and no land over 20 feet high could have been present within about 17 nautical miles on either side of the track.

OBITUARY

Henry Wilson-Fox, M.P.

WE much regret to record the death, on November 22 last after a short illness, of Mr. H. Wilson-Fox, a Vice-President of this Society, of which he had been a Fellow since 1898. Although not primarily a geographer, his intimate acquaintance with South Africa and his excellent capacities as a man of business had made him a valued member of the Society's Council, on which he had served without a break from 1914 onwards. His paper on "The Cape-to-Cairo Railway and Train Ferries," read before the Society on 1 December 1919, will be remembered as an interesting contribution to the subject of the improvement of communications in the African interior.

Born on 18 August 1863, Wilson-Fox was the son of the late Dr. Wilson-Fox, a distinguished pathologist, and was educated at Charterhouse and Marlborough, and afterwards at University College, London, and Trinity College, Cambridge, of which he was a scholar. Called to the bar in 1888, he went out to South Africa in the following year and became editor of the *South African Mining Journal* in 1892, and Public Prosecutor in Rhodesia in 1894. During the troublous times of the Matabele rebellion and after he did excellent work, particularly as Director of Transport in Mashonaland, and received the medal with clasp for his services. He became Manager of the British South Africa Company in 1898, and thenceforwards worked energetically in its interests, becoming Director in 1913. He had been Unionist M.P. for the Tamworth Division of Warwickshire since 1917. He was a noted lawn-tennis player, and his recreations included also golf and fishing.

CORRESPONDENCE

Geography as it is Taught.

THERE are times when prevailing ignorance of the Earth's surface nearer home than, say, Tibet requires to be combated, and to me, as an old travller by road, it is painful to note the frequency with which topographical knowledge, as set forth in books, is still dominated by the influence of the railway era. Our forefathers were familiar with the then existing highways of the Alps, but nowadays the young idea is trained to think in tunnels of the St. Gothard and Simplon variety, and modern road developments are entirely ignored.

I have just encountered, in the Society's house, a book issued by the Cambridge University Press, as "Part IV. Western Europe," of the *Cambridge Geographical Readers*, dated 1921. In the section dealing with France I find the following paragraph:

"Forming the boundary between France and Spain are the great rugged masses of the Pyrenees, almost impassable except by a few tracks, and these only with considerable difficulty. France's eastern frontiers are the Alps, dividing it from Italy; and further north the famous Jura mountains, which contain Mont Blanc, a peak of more than 15,000 feet in height."

Dismissing the absurdity of including Mont Blanc among the "famous" Juras, I wish to call attention to the completely erroneous summary of the Pyrenees as "impassable except by a few tracks." There are numerous mountain carriage-roads in this region; I compiled in 1911, from personal driving experience, a list of thirty-five cols passable by road.

Even if the reference to the "few tracks" is to be interpreted as applying only to routes from France to Spain, the following may be named as definite carriage roads across the ranges: Col du Pourtalet, Col du Somport, Col de Tosas, Col de Ronavaux, Col de Velate, Col de Maya, and Col de Perthus. The first two are fine highways of almost Napoleonic type, and one at least—the Somport—was traversed by a motor-diligence even ten years ago. There is an eighth road, moreover, into Spain, from Luchon and St. Béat to Viella, in the Val d'Aran, a distance of 55½ kilometres, the French custom-house being at Le Seriail and the Spanish at Lès.

Why, then, are the Pyrenees to be described as impassable? The rising generation is much more interested in road travel than if the railway were still the chief means of locomotion. It is deplorable that such errors should be promulgated in the year 1921. CHARLES L. FREESTON.

30, Palace Court, W.2.

The African Rift Valleys.

In connection with Mr. Wayland's very interesting paper on the Lake Albert Rift Valley, which appeared in the November number, I may call attention to an important discussion, by Dr. E. Kohlschütter, of his gravity observations in German East Africa, which was published in the *Göttingen Nachrichten* for 1911.* The gravity stations lie on the east-west lines, and cross more than one rift valley, with stations on the valley floor and on the scarps on either side. The discussion is detailed and intricate, and need not be repeated here, but the general conclusion was, that while the continental elevation as a whole is fully compensated, the scarps on either side of the rift valleys are nearly or quite uncompensated, the valley floors being about normal or showing a depth considerably less than the excess on the scarps. These results are, as is specifically recognized by the author, more in keeping with the hypothesis that the scarps have been thrust upwards by compression, than with the supposition that the valley floors have been dropped down by tension. That Mr. Wayland, working along wholly different lines, and without reference to his predecessor's work, should have arrived at a similar conclusion certainly strengthens its probability; nor will this support of the general principle be affected by any criticism in detail of the precise method by which the result is supposed to have been brought about. The agreement does not, however, establish the thesis; what it does is to make the question a very open one, whether those structural depressions in the surface of the African continent, for which Prof. J. W. Gregory has established the name of Rift Valley, are due to rifting or squeezing, to tension or compression. R. D. OLDHAM.

MEETINGS: ROYAL GEOGRAPHICAL SOCIETY: SESSION 1921–1922

THE following Candidates were elected Fellows of the Society on 19 December 1921:

Capt. Robert A. Archer, M.C., R.F.A.; Capt. John Oliver Mark Ashley, R.G.A.; Capt. Percy Kenneth Boulnois, M.C., R.E.; Alfred Brammall; Lieut.-Colonel H. Cornes, D.S.O., R.F.A.; Heyward Cutting; Robert Hamilton Dick,

* E. Kohlschütter, "Ueber den Bau der Erdkruste in Deutsch-Ostafrika," *Nachrichten v.d.k. Ges. d. Wiss. zu Göttingen*, 1911, pp. 1–40.

M.A.; Percy Livingstone Dickson; Mrs. Lucy Evans; Harry Herbert Flint, B.A., B.SC.; Paul Leon Giuseppi, F.R.C.S.; David Heron, D.SC.; Miss M. B. Hinton, B.A.; Frank Hutchen; Major J. A. A. Kernahan, I.M.S.; S. G. C. Knibbs; William MacInnes; Capt. J. F. Marindin; Michael Henry Mason; Ernest Martin Mellor; The Rev. Bishop Walter Henry Overs; Leonard Charles Piggott; Richard Kenneth Richardson; Francis Rodd; Lieut. A. Bertram Smith, R.N.R.; Lieut.-Col. Gerald Henry Summers, C.M.G., I.A.; Arthur Visick; Rev. Francis John Barwell-Walker, D.D., PH.D.; Rev. Ernest Alexanderson Wright, M.A.

Fourth Evening Meeting, 20 December 1921.—The President in the Chair.

Joint Meeting of the Society and the Alpine Club at the Queen's Hall.

PAPERS: The Mount Everest Expedition. Lieut.-Colonel C. K. Howard-Bury, G. Leigh Mallory.

Fifth Evening Meeting, 9 January 1922.—The President in the Chair.

ELECTIONS.—Lady Grace Baring; Benjamin Brooks; Francis Carter; Edward Maxwell Hinde Corbin; Vernon W. Stapleton-Cotton; John Northcote Deck; William Smith Duthie; Vyvyan Winstanley Frampton; Capt. Thomas Llewellyn Marshall Fuge; Stephen George Green; Edward Ralph Hempson; Capt. Lancelot Heygate; Edward Thomas Hudson; Mrs. Mary Caroline Stewart Hughes; Walter Jeffery; Colonel Courtenay Russell Kelly, C.M.G., D.S.O., R.A.; William Ramsay Kermack; Capt. W. H. Kirby, M.C.; Sir Curtis G. Lampson, Bart.; Thomas C. Lethbridge; Capt. Clement Procter Lowe; Miss Emmeline Lumb; Lieut.-Colonel Torquil John McLeod, D.S.O., I.A.; Mrs. Ellen Cameron Miller, O.B.E.; Frank Stanton Miskin; Edward Owen Pretheroe, M.C., B.A., LL.B.; James Shaw Robertson; William Sanger; Robert Scot Skirving, M.B., C.M.; Mrs. Maud Starkie; Colonel Hon. Hugh Edmund Thellusson, D.S.O., R.A.

PAPER: Across Wadai. Sir Philip Brocklehurst.

Sixth Evening Meeting, 23 January 1922.—The President in the Chair.

ELECTIONS.—Miss Mabel Eva Baldwin, B.A.; F. Leonard Bishop; S. E. Burrow; Ernest George Victor Clark; Capt. A. W. Cook; Miss Elizabeth Edmunds; Sidney D. Gamble, M.A.; Rev. William Pascoe Goard; Capt. George F. Gracey, D.S.O.; Rev. Herbert Halliwell; Henry J. Hands, M.A., L.C.P.; Jenan Thomas Hughes; Capt. Valentine Erskine Inglefield; Gilbert Cheston Massing, B.A.; Miss Frances Mary Overy; Lieut.-Colonel Frederick S. Penny, C.M.G., D.S.O., R.A.M.C.; John Ulrick Ransom, B.A.; Emory Ross; Major F. G. O. Sanderson, I.A.; Sydney Spencer; Lieut. George William Trinick, R.N.R.; Miss Edith Tucker; Flight-Lieut. Cresswell Turner, R.A.F.; Lewis Huth Walters.

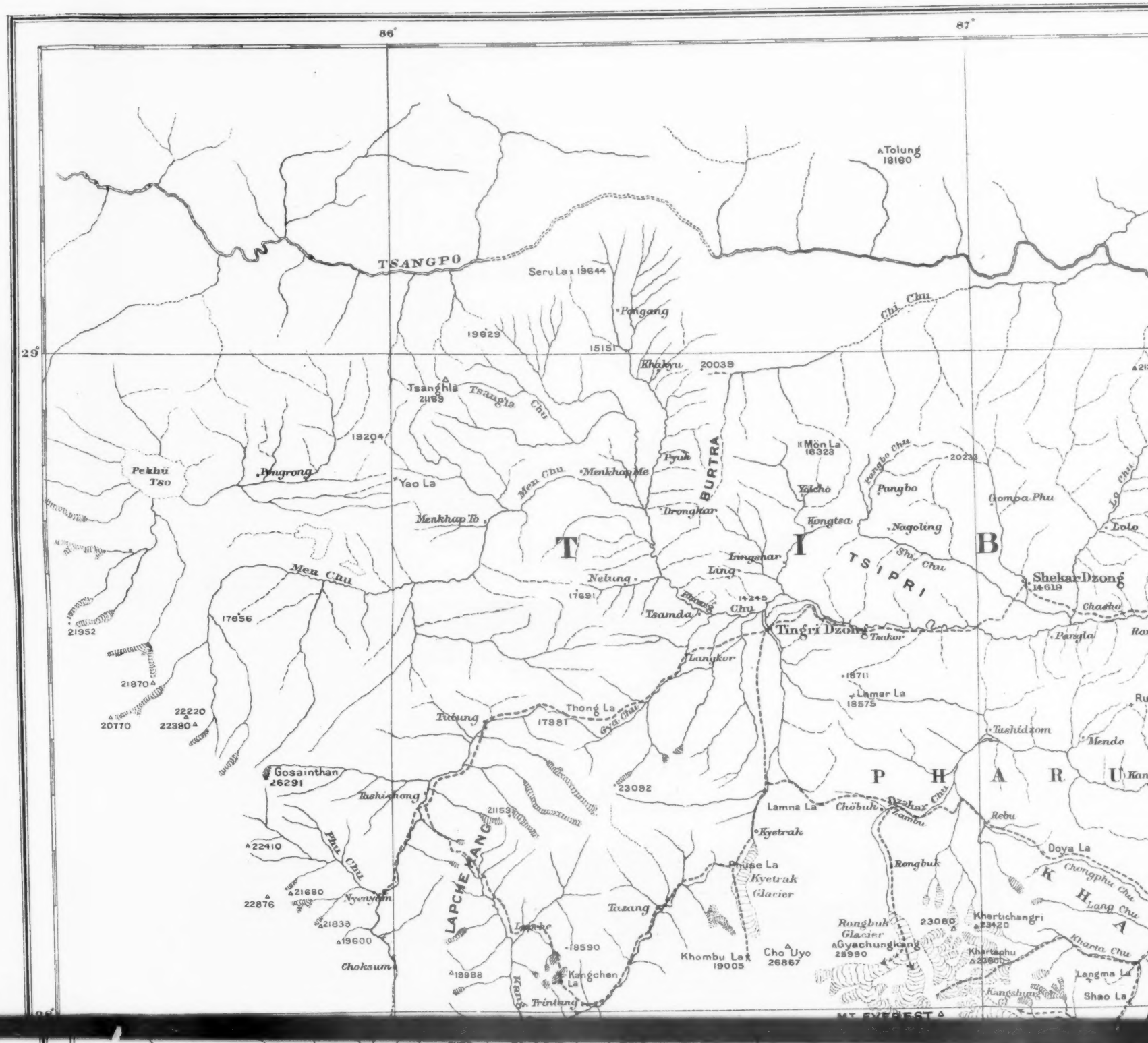
PAPER: Luristan. C. J. Edmonds.

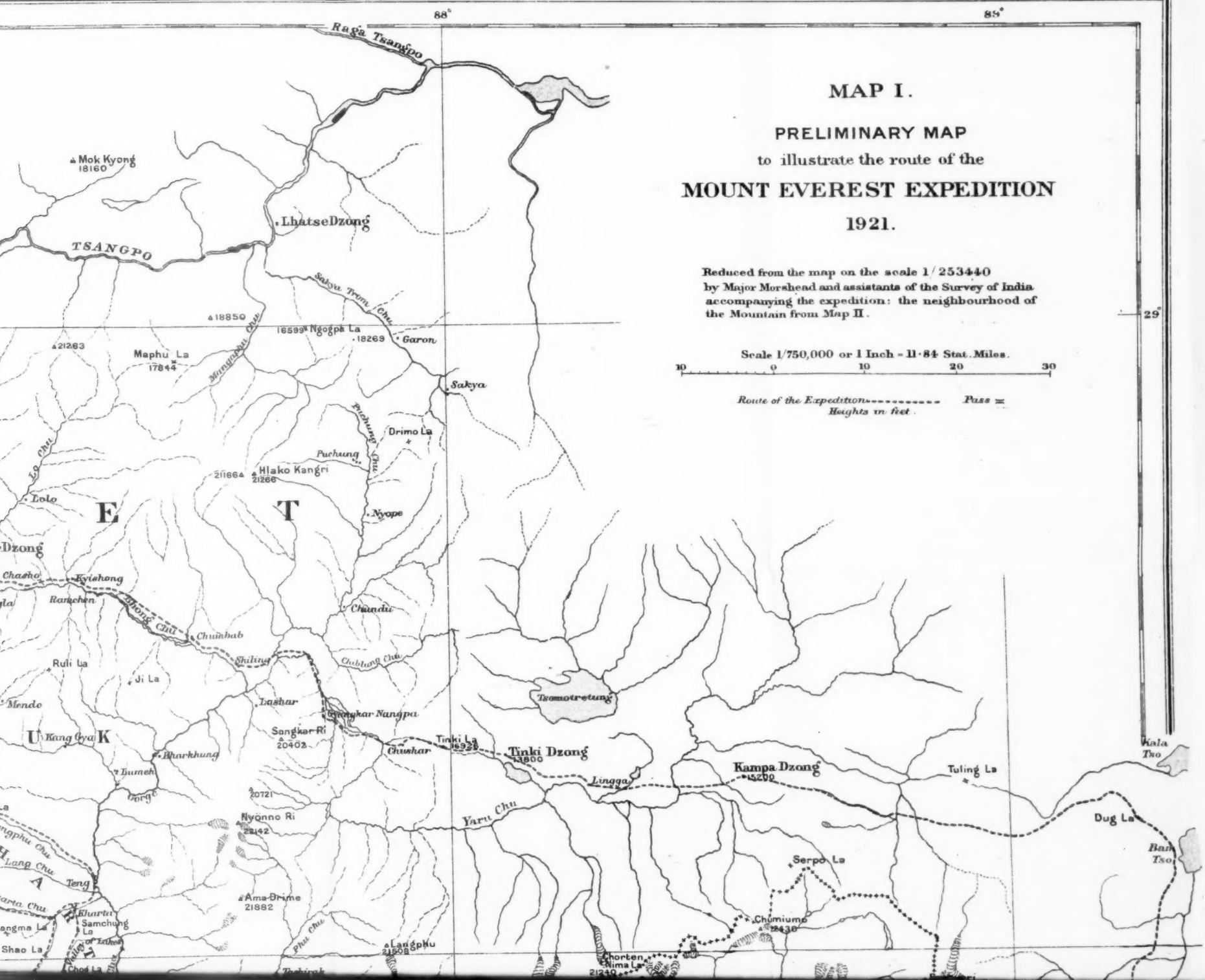
Third Afternoon Meeting, 16 January 1922.—The President in the Chair.

PAPER: The Archæology of the Ordnance Survey Maps. O. J. S. Crawford.

Christmas Lectures to Young People.

2 January 1922: A Ride on the Roof of the World. Miss Ella Sykes.
6 January 1922: Pictures from Mount Everest. The President.


86°
87°
29°
TSANGPO
Seru La 19644
Pangang
19629
15151
Khakyu 20039
Tsanghla 21169
Tsangta Chu
Chi Chu
Tolung 18180
19204
Pekhu Tso
Pangrong
Yao La
Mea Chu
Menkhap Me
Menkhap To
Pyuk
Dronghar
BURTRA
Mön La 16323
Yalcho
Pangbo Chu
20238
Pangbo
Gompa Phu
Lo Chu
Kongtsa
Nagoling
Lolo
T I B
TSIPRI
Shi Chu
Shekar Dzong 14619
Chasho
Lungnar
Ling
Nelung
17691
Tsamda
Phanak Chu
14245
Tingri Dzong
Tsakor
Pangla
Mea Chu
17656
21952
21870
20770
22220
22380
Lamkor
18711
Lamar La 18575
Thong La 17981
Gya Chu
Tabung
Tashidzom
Mendo
Gosainthan 26291
Tashichong
23092
P H A R U
Lamna La
Chöbuk
Dzakar Chu
Rebu
Kyetrak
Doya La
Rongbuk
Phuse La
Kyetrak Glacier
Chongphu Chu
K H A
Lang Chu
22410
Phu Chu
21680
22876
Nyenyam
21839
19600
LAPCHE KANG
Tazang
Rongbuk Glacier
23080
Khartichangri 23420
Gyachung Kang 25990
Khartaphu 23800
Khartsa Chu
Langma La
Choksum
19988
18590
Kangchen La
Khombu La 19005
Cho Uyo 26867
Kangshung G.
Shao La
Trinlang
MT EVEREST



MAP I.

PRELIMINARY MAP

to illustrate the route of the

MOUNT EVEREST EXPEDITION

1921.

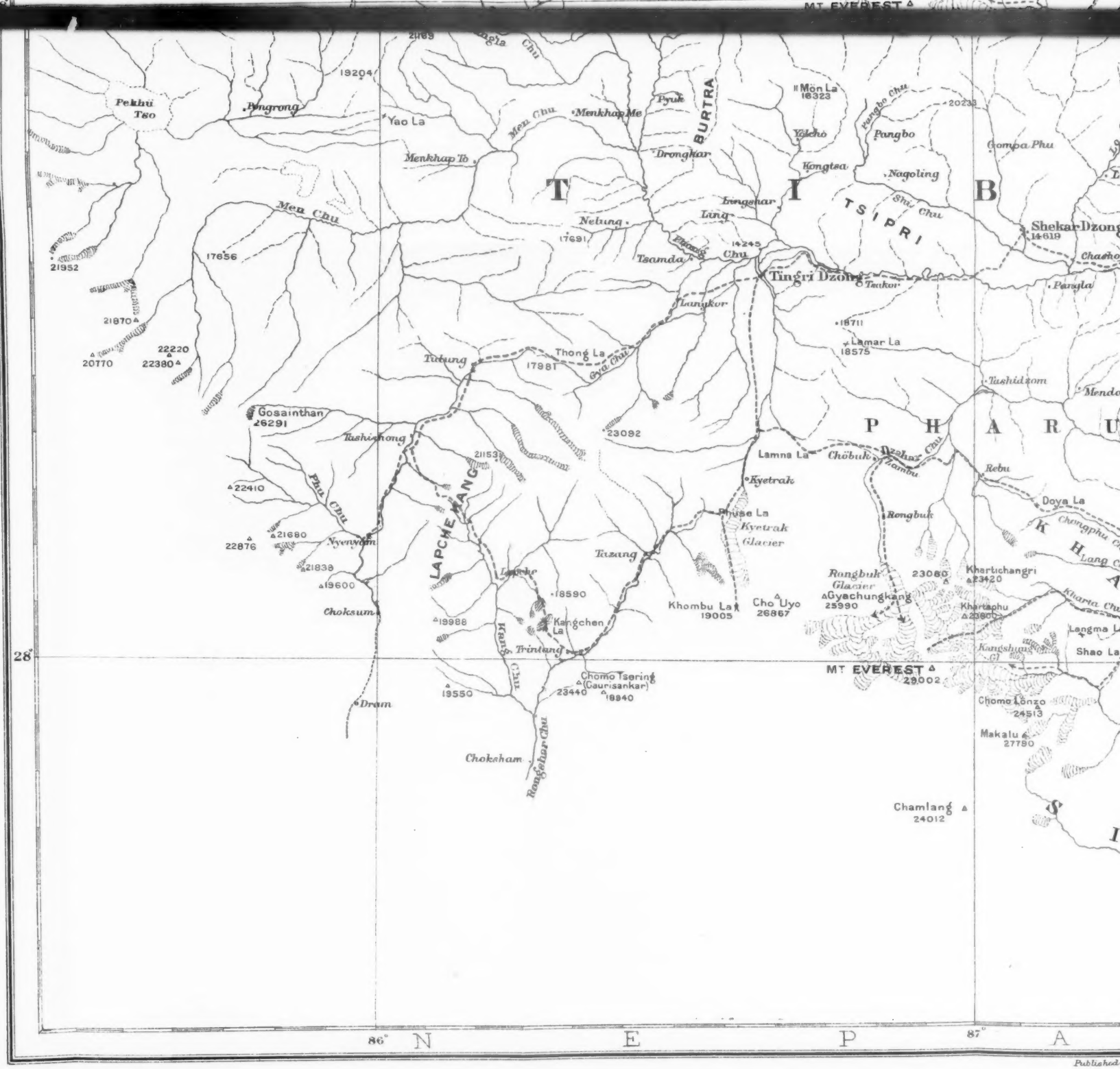
Reduced from the map on the scale 1/253440 by Major Morshead and assistants of the Survey of India accompanying the expedition: the neighbourhood of the Mountain from Map II.

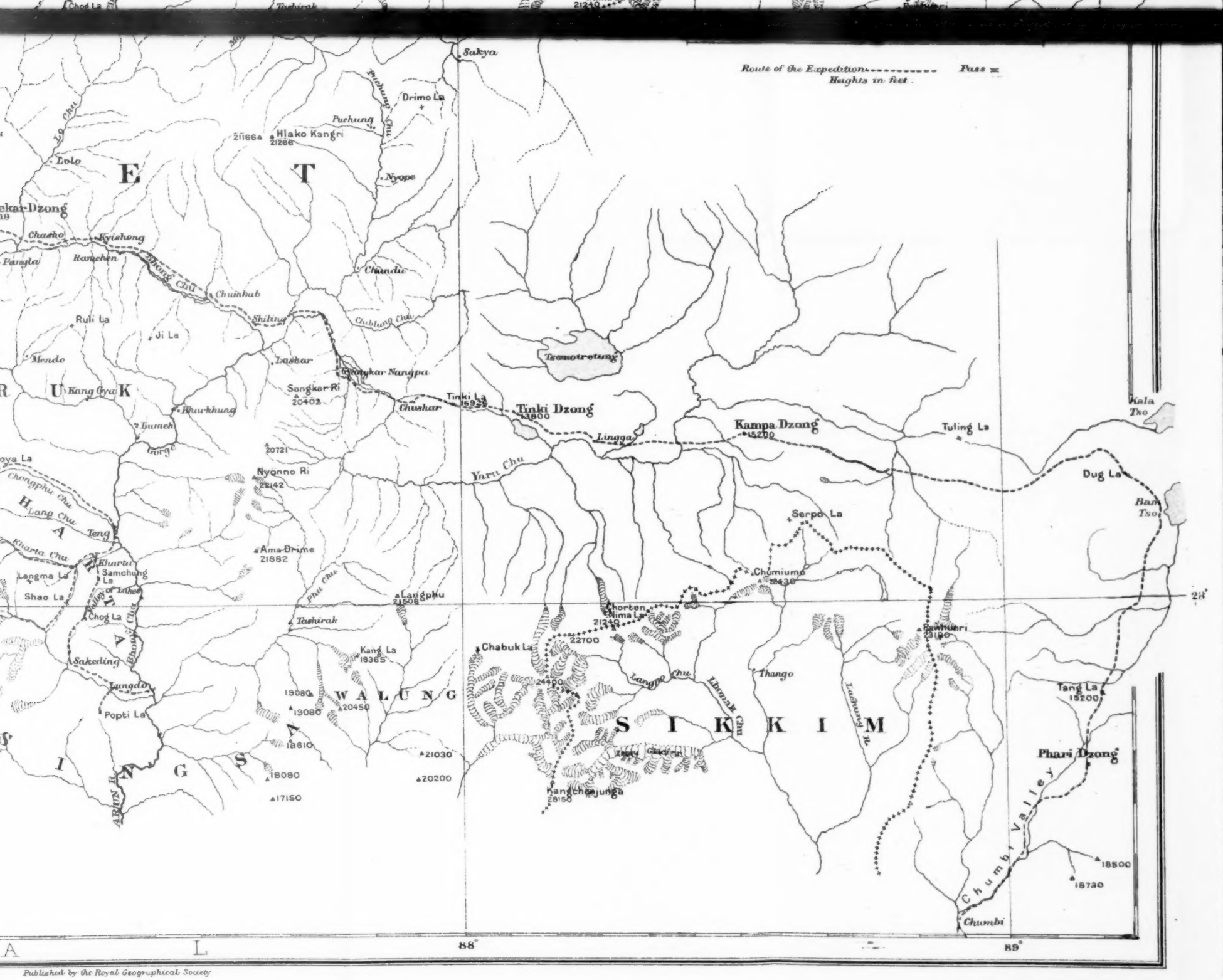
Scale 1/750,000 or 1 Inch = 11·84 Stat. Miles.

10 0 10 20 30

Route of the Expedition ---------- *Pass* ⌅

Heights in feet.


MT EVEREST
Pekhu Tso
Pungrong
Yao La
Menkhap Me
Menkhap To
Mea Chu
Pyuk
BURTRA
Drongkar
Mön La
18323
Yalcho
Pangbo
Pangbo Chu
Gompa Phu
Kongtsa
Nagoling
Shar Chu
TSIPRI
Shekar Dzong
14619
Tingri Dzong
Tsakor
Pangla
Lungkor
Lamar La
18575
Tashidzom
Mendo
Nelung
17691
Tsamda
Lung
Lungshar
Thong La
17981
Gya Chu
Tutung
Gosainthan
26291
Tashichong
23092
PHARU
Lamna La
Chöbuk
Dzakar Chu
Tambu
Rebu
Doya La
Rongbuk
Kyetrak
Kyetrak Glacier
Phuse La
Phu Chu
Nyenyam
LAPCHE KANG
Tazang
Lapche
Rongbuk Glacier
Gyachungkang
25990
Khartichangri
23420
Khartaphu
Choksum
Kangchen La
Khombu La
19005
Cho Uyo
26867
Trinlang
Kama Chu
MT EVEREST
29002
Chomo Tsering
(Caurisankar)
23440
18940
Chomo Lonzo
24513
Makalu
27790
Dram
Chokaham
Rongshar Chu
Chamlang
24012
Shao La
Langma
Khama Chu
Chang Chu
Lang
86°
87°
28°
NEPA



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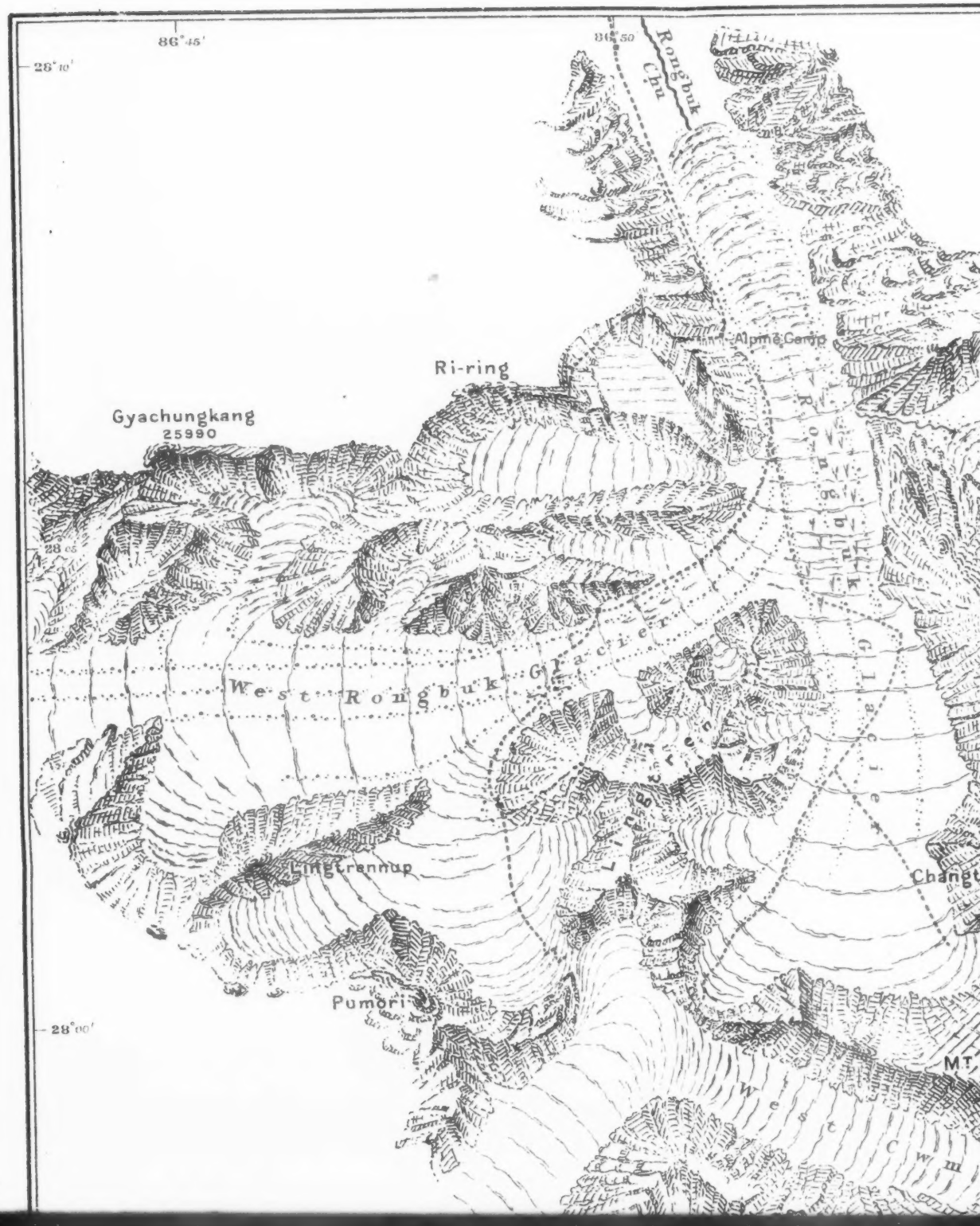
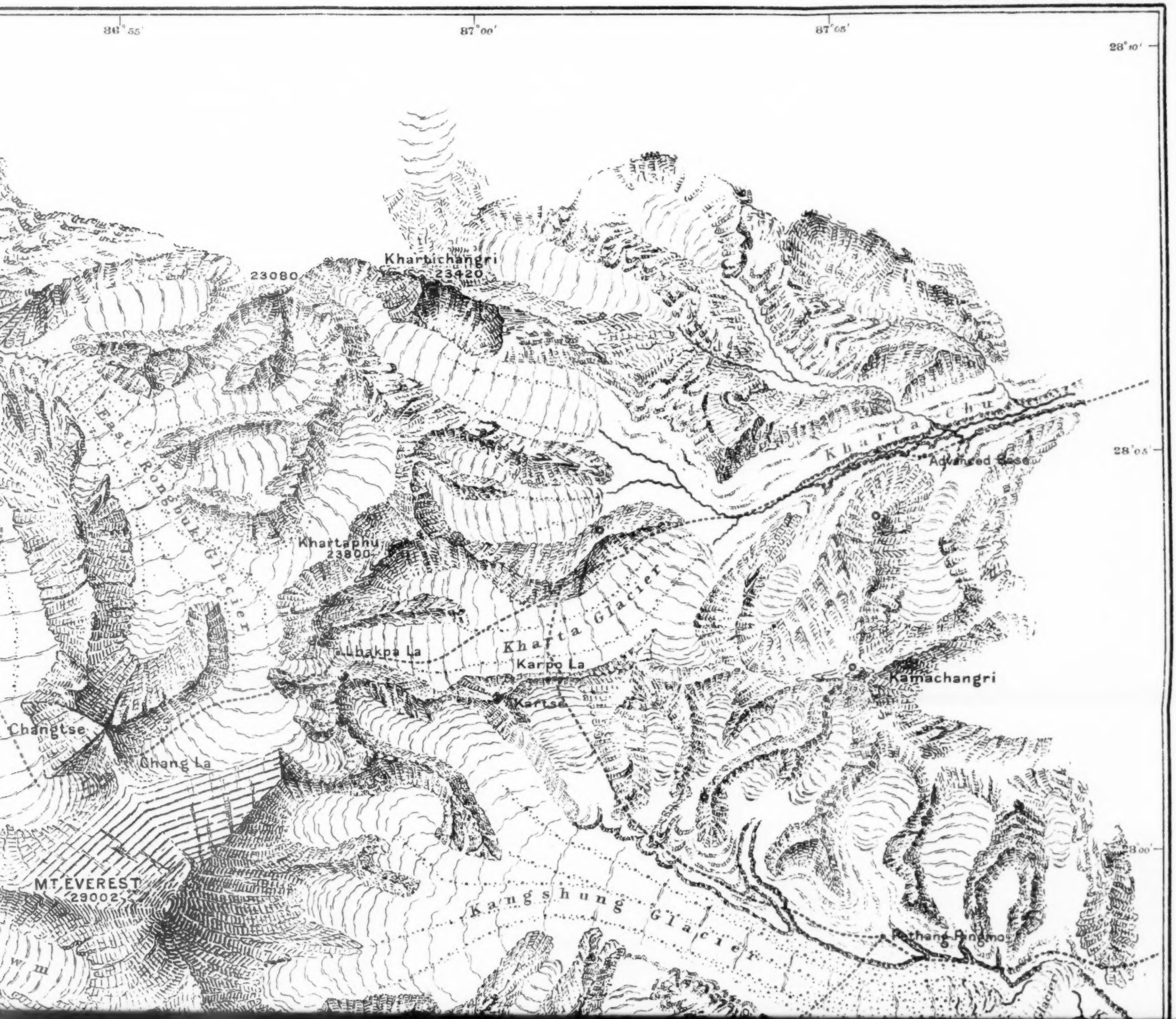
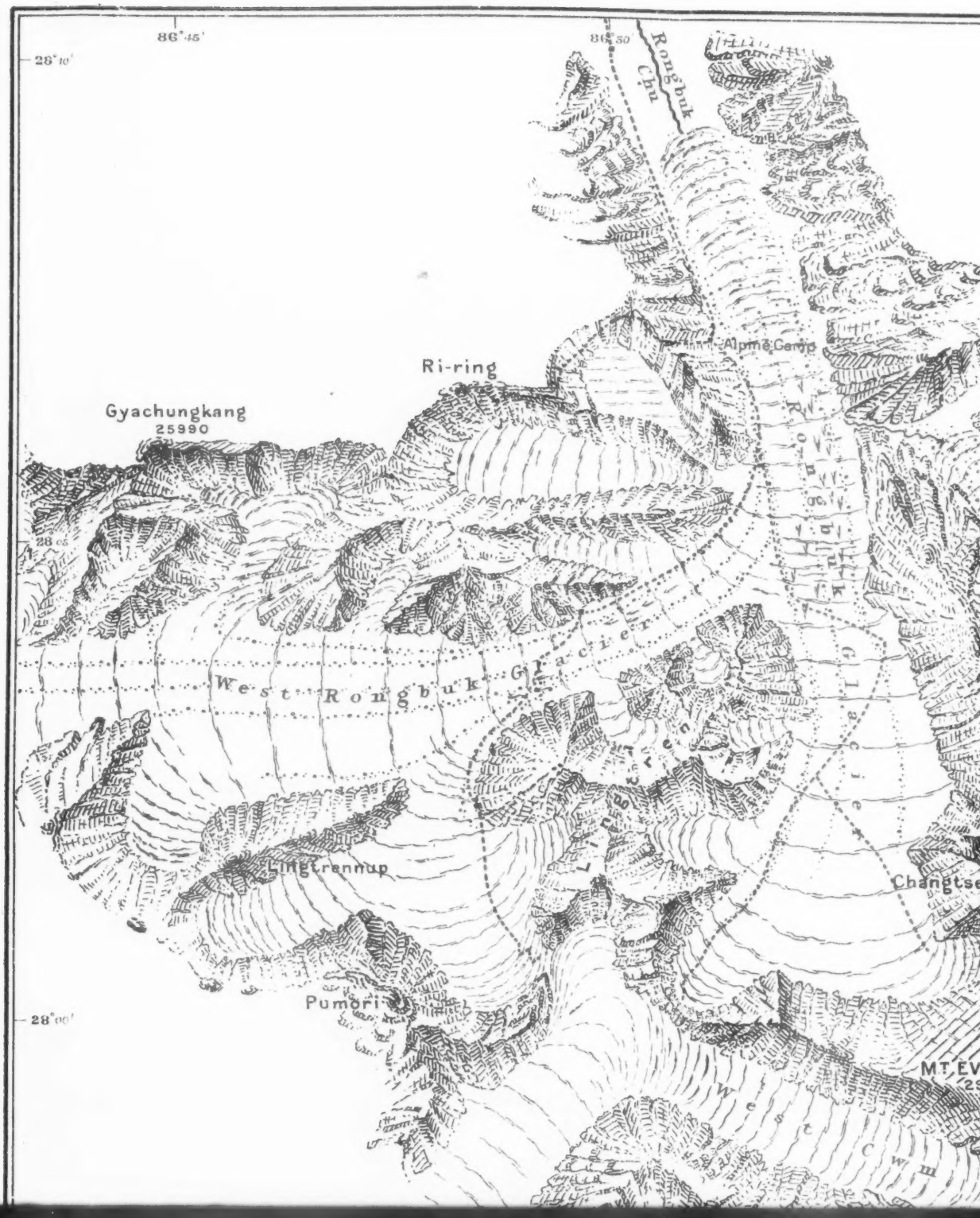
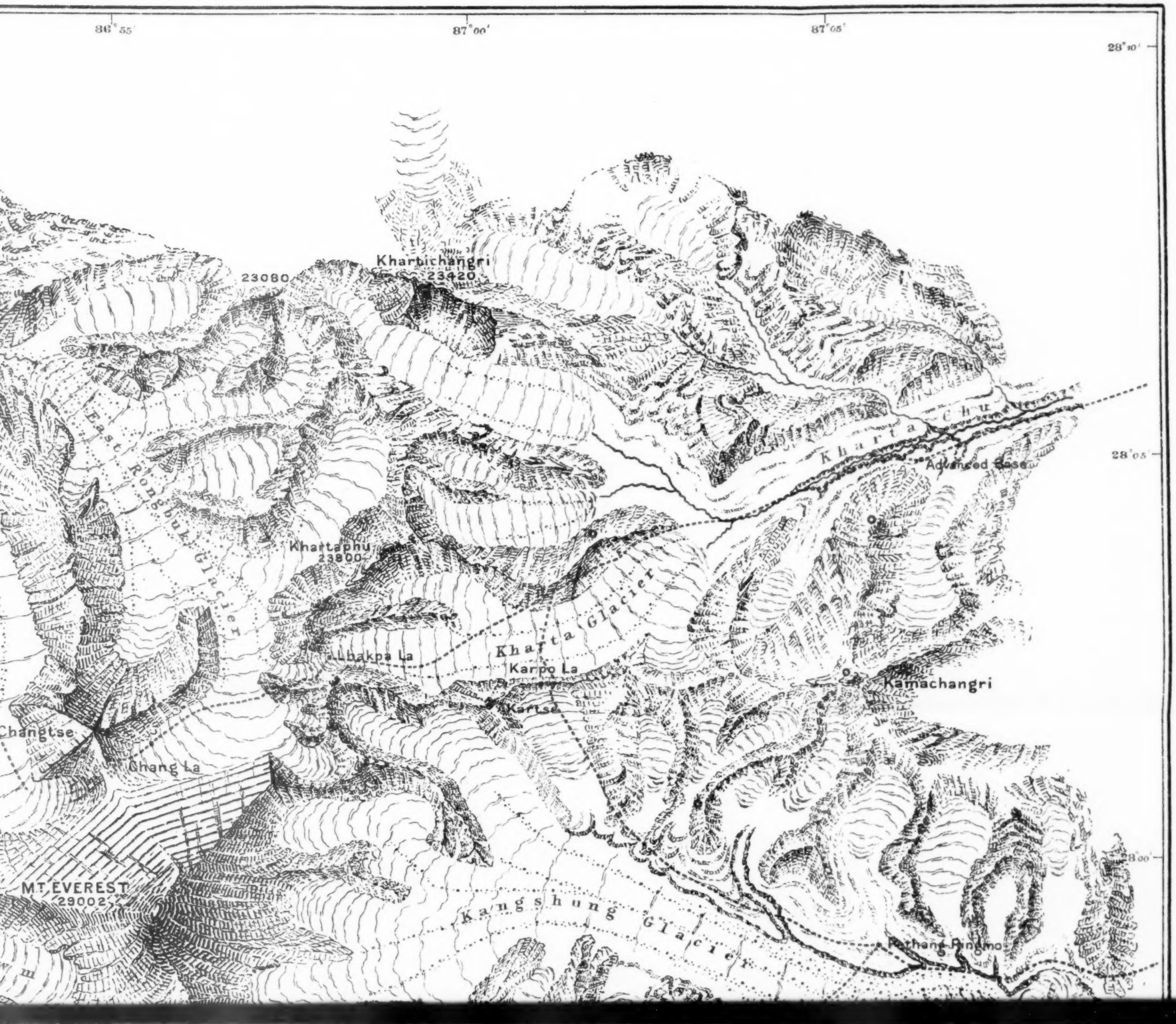
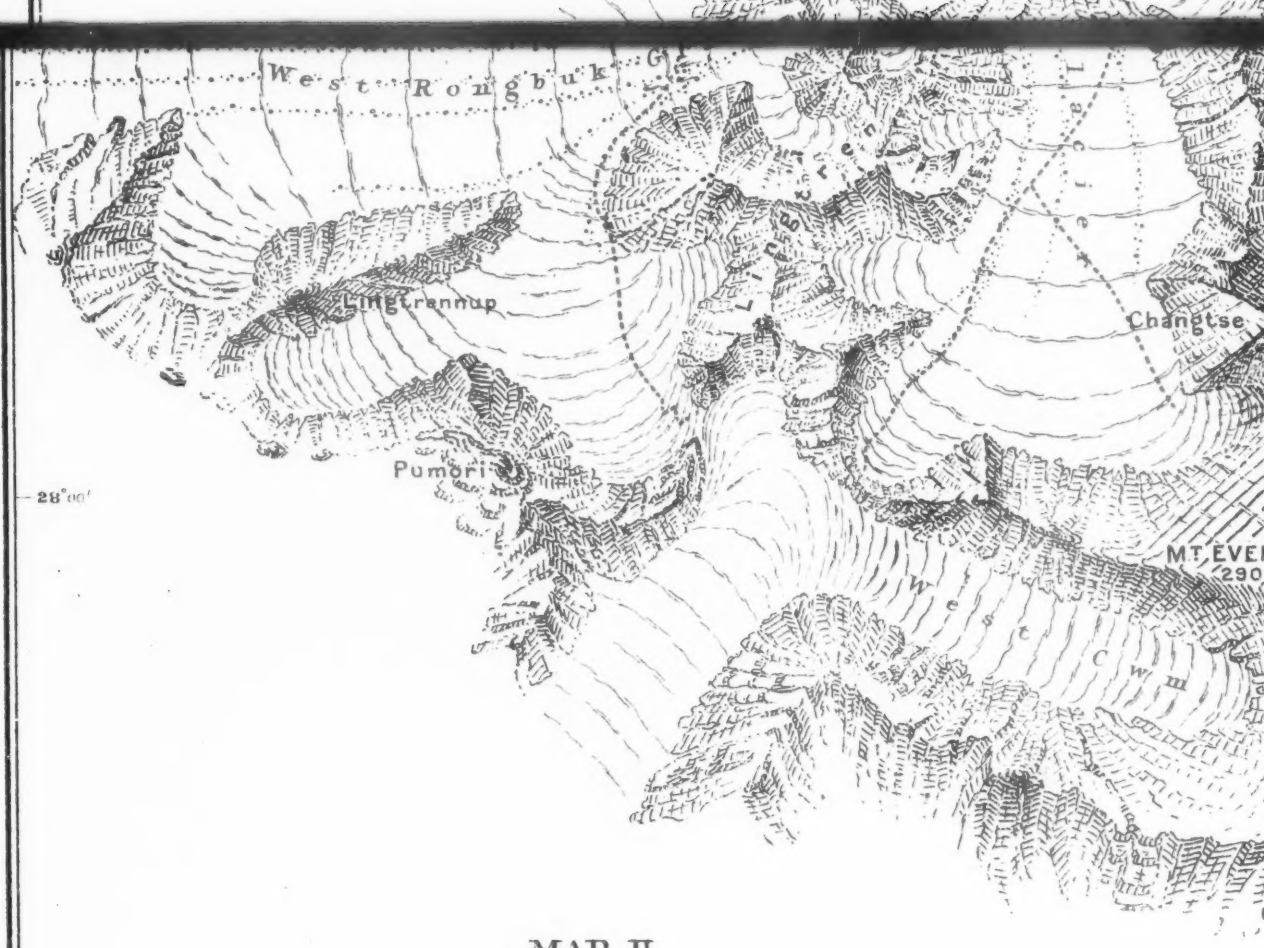
MT EVEREST EXPEDITION.
1.


86°45'
86°50
28°10'
28°05
28°00'
Rongbuk Chu
Alpine Camp
Ri-ring
Gyachungkang
25990
West Rongbuk Glacier
Lingtrennup
Pumori
Changtse
M.T.
West Cwm


86°55'
87°00'
87°05'
28°10'
28°05'
28°00'
Kharpichangri
23420
23080
East Rongbuk Glacier
Khartaphu
23800
Lhakpa La
Karpo La
Kartse
Changtse
Chang La
MT. EVEREST
29002
Kangshung Glacier
Khar ta Glacier
Khar ta Chu
Advanced Base
Kamachangri
Rathang Pinguo


86°45'
86°50'
28°10'
28°05'
28°00'
Rongbuk Chu
Ri-ring
Gyachungkang
25990
Lingtrennup
Pumori
West Rongbuk Glacier
Changtse
West Cwm


86°55'
87°00'
87°05'
28°10'
28°05'
28°00'
Kharbichangri
23420
23080
East Rongbuk Glacier
Khartaphu
23800
Khartaphu
23800
Lhakpa La
Khar ta Glacier
Karpo La
Kartse
Changtse
Chang La
MT. EVEREST
29002
Kangshung Glacier
Kharta Chu
Advanced Base
Kamachangri
Pethang Ringmo



MAP II

Preliminary Map

of

MOUNT EVEREST

constructed at the R.G.S.

from photographs and sketches

made by the

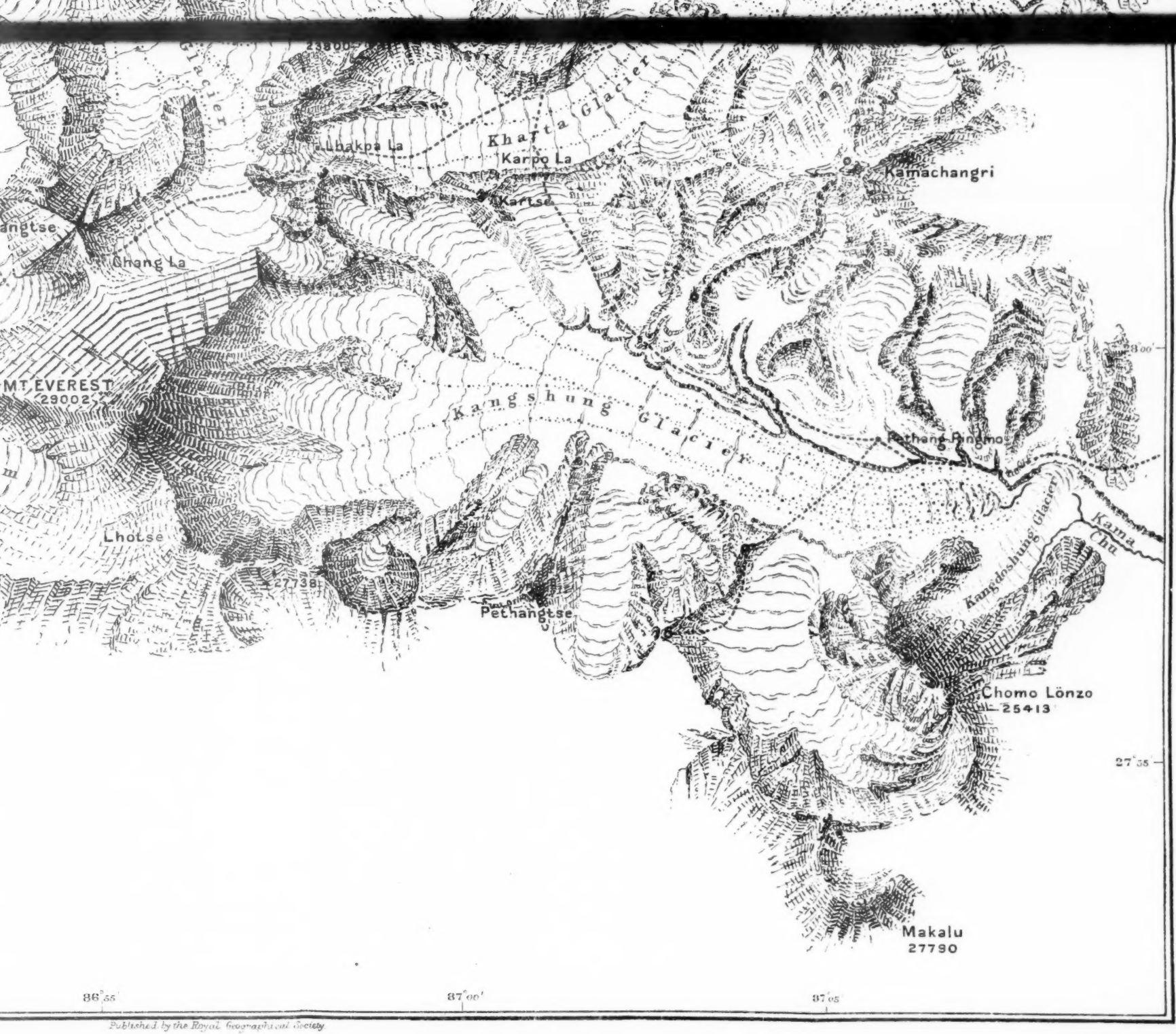
EXPEDITION OF 1921

Scale 1/100,000 or 1 Inch = 1·58 Stat. Miles.

Miles 1 ¾ ½ ¼ 0 1 2 3 4 5 Miles

o = *Panoram Camera Station*

Price Two Shillings



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MOUNT EVEREST
II